The Magazine of

DATAMATION 59

January/February

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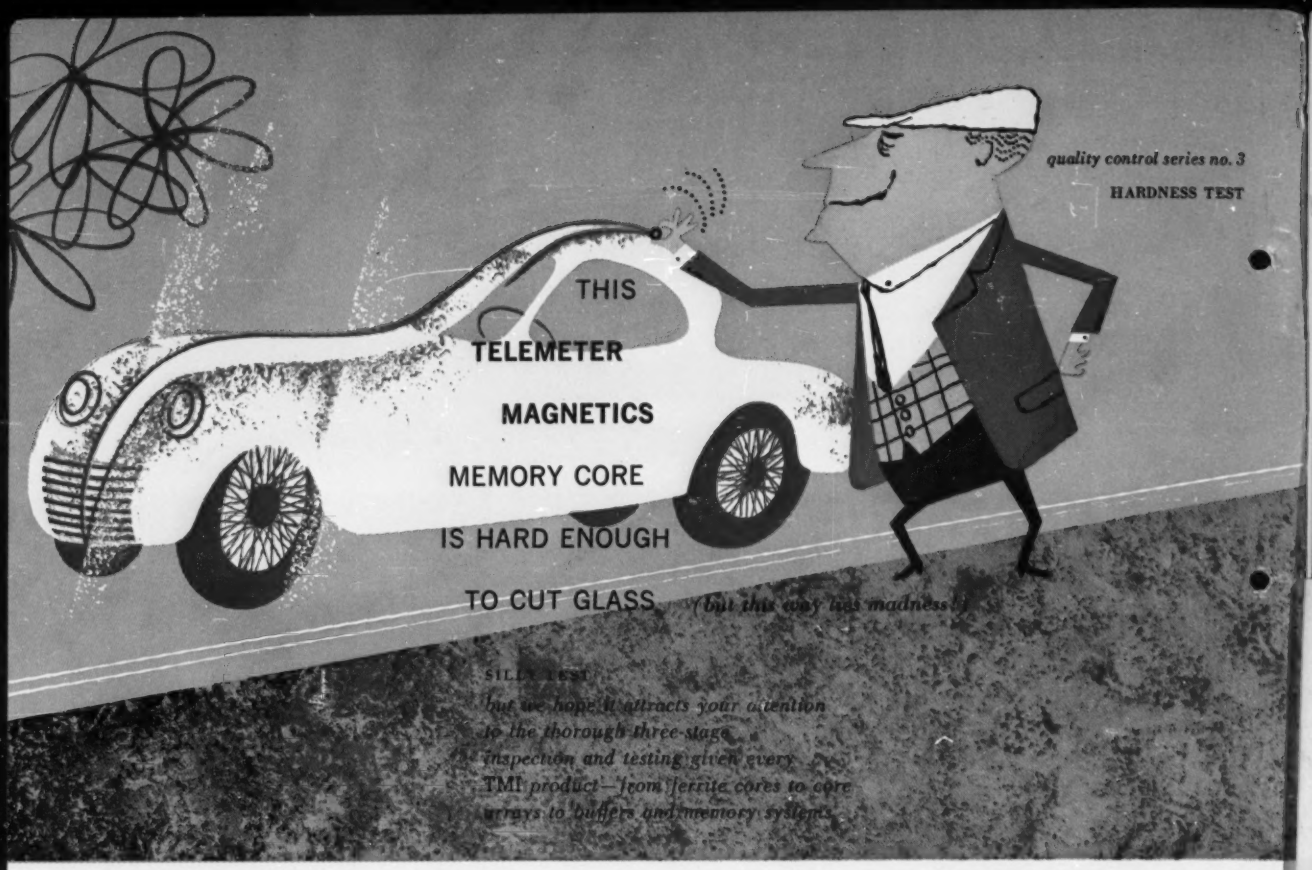
R/E Research & Engineering

WESTERN JOINT COMPUTER CONFERENCE ISSUE



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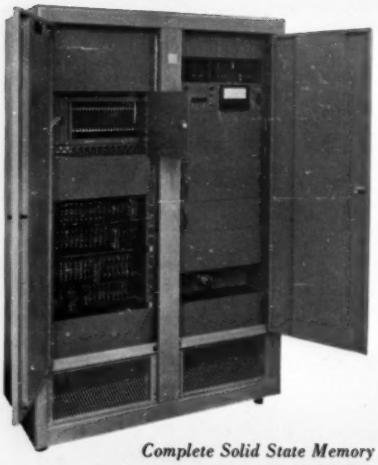

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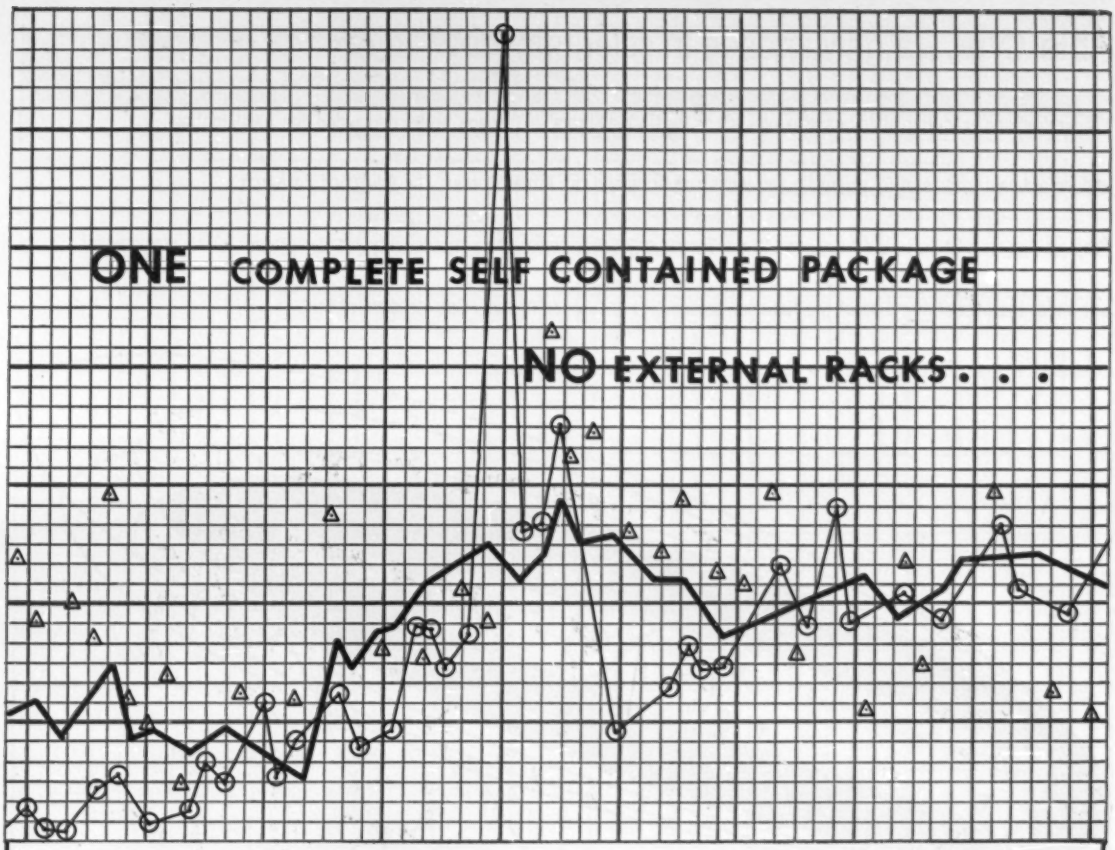

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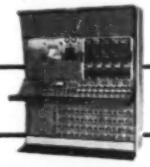

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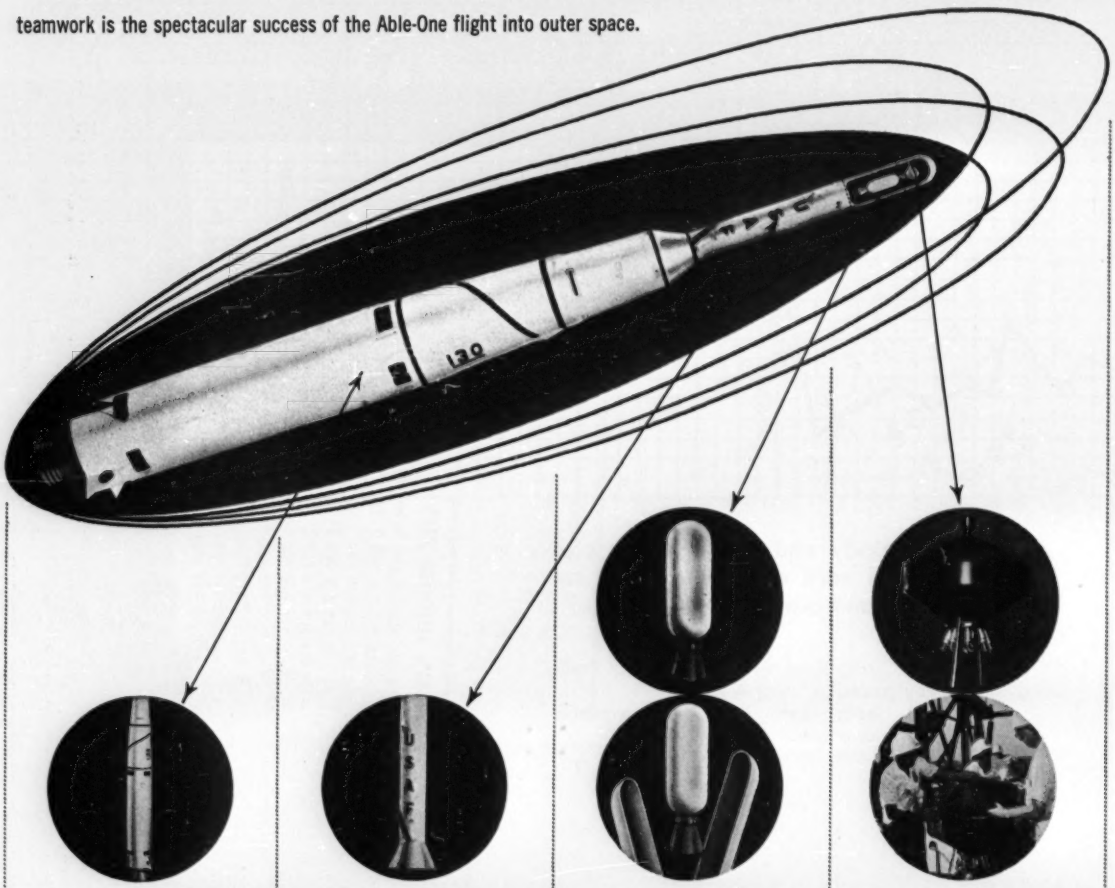
Preparation and execution of an undertaking such as the United States' IGY space probe demanded the participation and exceptional efforts of 52 scientific and industrial firms and the Armed Forces. The Advanced Research Projects Agency and the AFBMD assigned Space Technology Laboratories the responsibility for the project which was carried out under the overall direction of the National Aeronautics and Space Agency. One measure of this teamwork is the spectacular success of the Able-One flight into outer space.



1st stage: Vehicle, Douglas Aircraft **Thor** IRBM; propulsion, Rocketdyne; airframe, control, electrical and instrumentation, Douglas Aircraft; assembly, integration, and checkout, Douglas Aircraft.

2nd stage: Propulsion system and tanks, Aerojet-General; control, electrical, instrumentation, accelerometer shutoff, and spin rocket systems, STL; assembly integration, and checkout, STL.

3rd stage: Rocket motor, U. S. Navy Bureau of Ordnance and Allegheny Ballistic Laboratory; structure and electrical, STL; assembly, integration, and checkout, STL; ground testing, USAF's Arnold Engineering Development Center.

Payload: Design and production of **Pioneer,** the payload of the Able-One vehicle, was conducted by STL in addition to its overall technical direction and systems engineering responsibility of the Air Force Ballistic Missile Division project. This highly sophisticated package included a NOTS TV camera and transmitter and Thiokol rocket motor.

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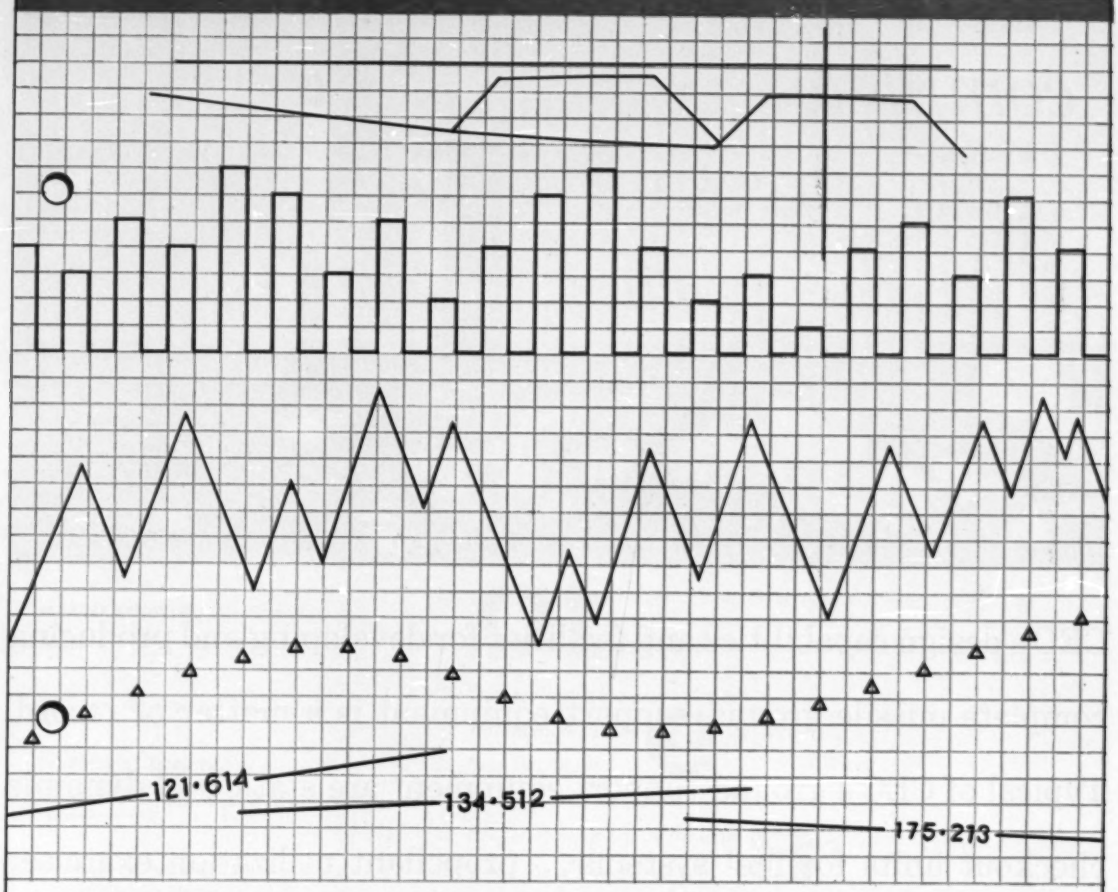

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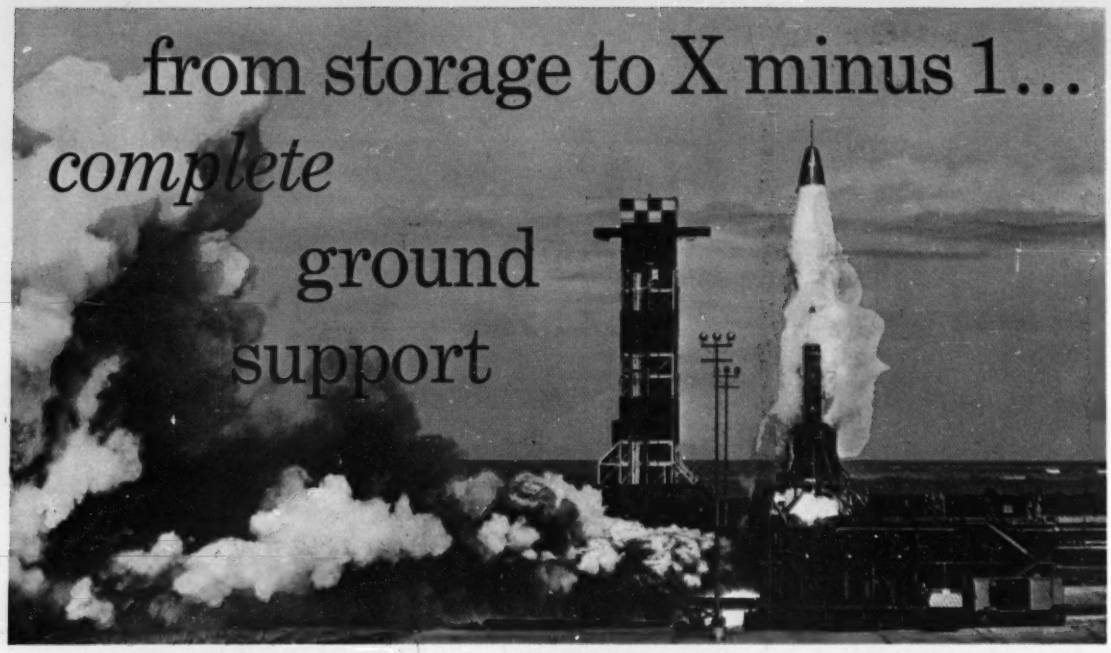

CEC's design capabilities and facilities for developing and producing complete missile ground support equipment is a matter of record. Typical of CEC's ground support equipment are static and dynamic checkout units for fuel systems . . . propellant utilization exerciser systems...and electronic systems for telemetry, inertial guidance, and control checkout. For full information, send for CEC Bulletin 3017-X2.

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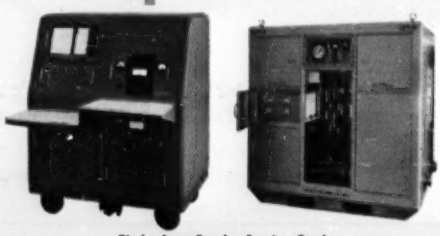

Pneumatic Checkout System is essentially a go, no-go device that automatically pressurizes and tests missile pneumatic systems during storage and pre-countdown periods. Sensing units detect any malfunction, transmit signals to automatic comparator.

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DATAMATION 59

the automatic handling of information

volume 5, number **1**

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WESTERN JOINT COMPUTER CONFERENCE

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ON OUR COVER—"WJCC" appears on the screen of a Memo-Scope storage type oscilloscope, manufactured by Hughes Products, Hughes Aircraft Company. This instrument displays electrical traces for an infinite length of time. Hence, it becomes unnecessary to photograph transients unless they are required for historical purposes. Letters, drawings or other information may be programmed on the viewing screen by manually or automatically sweeping through the "X" and "Y" axes on the front of the 'scope.

NEXT ISSUE—In the March/April issue, DATAMATION's feature article will be entitled "Space Age Computing—The Role of Data Processing in Trajectory Computation, In-Flight Tracking and Data Reduction." Presented will be an account of data processing as carried out at Space Technology Laboratories, Inc., in support of the Air Force ballistic missile and space probe programs.

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R/E, The Magazine of DATAMATION, welcomes manuscripts of three general types: application articles dealing with small, medium and large electronic data processing systems; articles covering the design of components, sub-systems and systems; and other general articles of interest to the data processing industry. Material submitted should be accompanied by pictures and illustrations when possible. Unsolicited manuscripts to be returned to writer should include return postage but editor assumes no responsibility for their safety or return (although all reasonable care will be taken).

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Three Sandwich Tapes are now available:

#188—For applications requiring standard output level. 1.5 mil polyester base, 0.35 mil magnetic coating, 50 micro-inch protective layer.

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WESTERN JOINT COMPUTER CONFERENCE

at

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MARCH

3, 4 & 5

ROBERT R. JOHNSON
General Electric Computer Laboratory
GENERAL CHAIRMAN

RICHARD W. MELVILLE
Stanford Research Institute
VICE CHAIRMAN

A safe point which could be made when speaking of the delegates attending the 1959 Western Joint Computer Conference is that though they represent many different quarters of the computer industry, not one of them believes computer development "has gone about as far as it can go."

Conference Chairman Johnson and Technical Program Chairman Melville develop this point in messages on page nine by discussing the conference theme — "New Horizons in Computer Technology." These statements, then, set the stage for what planners promise will be a conference replete with new ideas.

San Francisco's Fairmont Hotel is the site of this year's WJCC. March 3, 4 and 5 are conference dates.

Three organizations, Institute of Radio Engineers, American Institute of Electrical Engineers and Association for Computing Machinery, are again sponsoring the gathering. Registration estimate is 1600 delegates.

Twenty-four sessions (approximately 75 papers) will comprise the technical program. Triple sessions are planned for Tuesday, March 3, morning and afternoon. Double sessions will be offered, mornings and afternoons, on Wednesday and Thursday, March 4 and 5.

All registration will take place at the Fairmont Hotel. There will be no advance registration. Registration times are 6 to 9 p.m. on March 2; 7:30 a.m. to 5 p.m. on March 3 and 4; and 7:30 a.m. to 1 p.m. on March 5. The following fees will be payable when registering: $6.00 for members of the sponsoring organizations, $7.00 for non-members and $2.00 for students.

Approximately 40 exhibitors will occupy 64 booths in the exhibit area located in the Fairmont's Nob Hill, Gold, Empire, Green and Garden Rooms. The exhibits will be open to registrants and the general public from noon to 6 p.m. on March 3, from noon to 9 p.m. on March 4 and from 9 a.m. to 6 p.m. on March 5.

A "floating" cocktail party will be a feature of this year's conference. Those paying the $4.50 fee will tour San Francisco Bay aboard the "Harbor Queen" which will leave Fisherman's Wharf at 5:30 p.m. on Tuesday, March 3. There will be cocktail service aboard, of course.

A conference luncheon will be held on March 4 at noon. Fee will be $4.00.

A copy of the conference proceedings will be sent to each registrant. Copies may be secured by those unable to attend who send the appropriate registration fee (see fees, above) to: Mr. Robert M. Bennett, Jr., P. O. Box 381, Station A, Palo Alto, Calif.

From 1951 to 1955 Dr. Robert R. Johnson, Chairman of the 1959 Western Joint Computer Conference, was responsible for logical design for a business data processor and an airborne interceptor computer at Hughes Aircraft. His experience includes research and design of digital airborne computers, business data processing systems, machine tool automation equipment, and servo-mechanisms — and he has several patents pending.

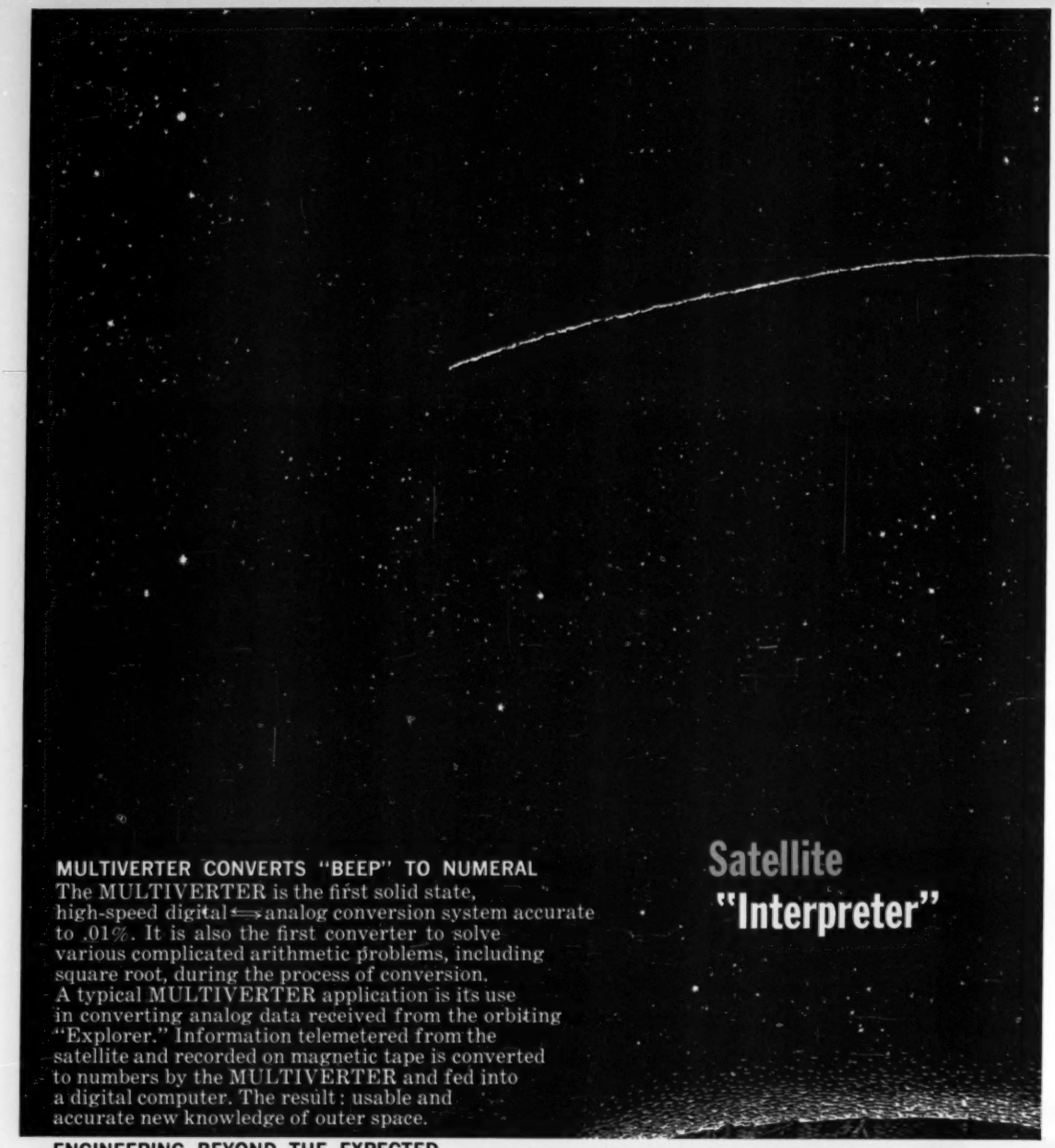
Dr. Johnson is now Manager of General Electric's Computer Laboratory in Palo Alto. Original activity of the Laboratory was the redesign, development, programming, and operation of the ERMA systems for the Bank of America.

A member of the American Institute of Electrical Engineers and I.R.E. Dr. Johnson holds a B.S.E.E., University of Wisconsin, 1950; M.S.E.E., Yale University, 1951; and Ph.D., from the California Institute of Technology, 1955.

Richard W. Melville, Chairman of the Technical Program Committee of the 1959 WJCC and Vice Chairman of the Conference, is head of the Computer Development Group in the Engineering Research Division of Stanford Research Institute, Menlo Park, Calif. His present work is in the field of Information Retrieval — he has worked on the mechanical design of the ERMA (Electronic Recording Machine, Accounting) system; the engineering evaluation of a data-processing computer; system studies in inventory and process control, and the design of special data-processing equipment.

Before coming to SRI in 1953, Dr. Melville was a member of the staff of the Electronic Computer Project at the Institute for Advanced Study at Princeton, New Jersey.

A member of I.R.E., the Cornell Society of Engineers, and other organizations, he studied Engineering at Cornell University, the University of Rochester, and Rutgers University.



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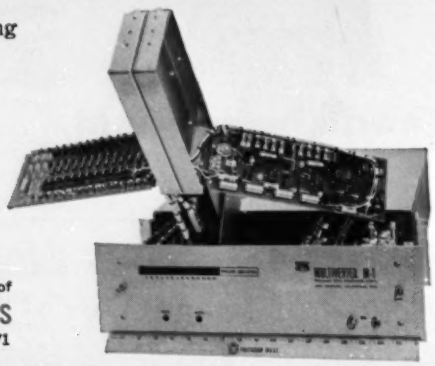
MULTIVERTER CONVERTS "BEEP" TO NUMERAL
The MULTIVERTER is the first solid state, high-speed digital ⟺ analog conversion system accurate to .01%. It is also the first converter to solve various complicated arithmetic problems, including square root, during the process of conversion. A typical MULTIVERTER application is its use in converting analog data received from the orbiting "Explorer." Information telemetered from the satellite and recorded on magnetic tape is converted to numbers by the MULTIVERTER and fed into a digital computer. The result: usable and accurate new knowledge of outer space.

ENGINEERING BEYOND THE EXPECTED
The need for highly accurate measurement in an accelerating technology called for a solid state converter with an accuracy of .01% and a speed of four microseconds per bit. The MULTIVERTER and related accessories resulted. One immediate application has been the interconnection of Packard Bell's TRICE, the first incremental differential analyzer to operate in real time, with various analog systems. Other applications include Missile Impact Prediction, Coordinate Conversion, Orbit Prediction and Solid State Automatic Checkout Systems.



Packard Bell Computer Corp., a subsidiary of
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MESSAGES

An interesting aspect of our computer business is that each successful development and application of our "information handling machines" apparently leads to a whole new set of ideas and applications. This growth is evidenced by the tremendous expansion of the activity of our parent professional societies in the computer field. The American Institute of Electrical Engineers, The Institute of Radio Engineers, and the Association for Computing Machinery, find new computer interests and applications emerging and expanding in all phases of their fields.

The 1959 Western Joint Computer Conference is presenting a view of these "New Horizons with Computer Technology." New horizons in computer design are appearing — new circuits and devices are arising from improved research efforts of our maturing computer industry; new vistas are opening as a result of knowledge gained by widely successful and economic utilization of our early computers; our entire profession is growing, is proud of its accomplishments and promises future progress.

Our annual conference is intended to provide an opportunity for the professional people in the computer industry to discuss their technical and business interests and accomplishments. The 1959 WJCC extends a special welcome to all those interested in viewing these "New Horizons."

ROBERT R. JOHNSON, Chairman
Western Joint Computer Conference

LUNCHEON

Delivering the only luncheon address at the 1959 WJCC will be Col. Darwin E. Ellett, Chief of the Data Systems Plans Division, Directorate of Plans and Programs, Air Materiel Command headquarters, Dayton, Ohio.

Col. Ellett will address the conference audience in the Fairmont's Tonga Room on March 4. His topic—"New Horizons in Systems."

COL. DARWIN E. ELLETT
Air Materiel Command
LUNCHEON SPEAKER

Computer technology has emerged dramatically from the limiting boundaries of accounting and the mathematical sciences and is now fully into a new era. Computers are moving boldly into the realms of decision-making and the simulation of mechanical and human learning processes.

These probings into challenging new computer applications have dictated that the 1959 Western Joint Computer Conference be shaped around a theme of "New Horizons with Computer Technology."

These horizons are imposing. For instance, a high-priority assignment is that of information retrieval and processing. The demands created by those tasks are so severe as to disqualify existing general-purpose equipment. Their lack of versatility and adequate dimensions rules them out as a means of satisfactorily handling these massive problems. Thus, a constant "crash" program is necessary to satisfy the need for new computer designs.

Then there is an almost bewildering outpouring of new techniques. In the main the goal is common to all, although the models under development for implementation of the logic of computer systems are radically different from the flip-flop and gate models which have been, and are, in use. An important objective is to pack more functional components into always-smaller space.

Yet another consideration is that which some thoughtful engineers consider a most logical step in recognizing the new stature of computer technology, and to introduce a higher degree of sophistication: establishment by the university of a graduate school of computer sciences. The conviction is that the growth of computer and related technologies has reached a level where they are a legitimate activity of the university and should be accorded full academic status.

RICHARD W. MELVILLE, Chairman
WJCC Technical Program

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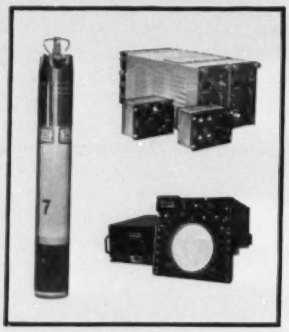
AN ASW SYSTEM... DISPLAY/AIRBORNE RECEIVER/SONOBUOYS

Anti-submarine warfare equipment designed, developed and produced by *The Magnavox Company*, in conjunction with the Navy Department, provides patrol aircraft with eyes that see underwater by day and by night. The AN/ASA-16 Display System, together with SONOBUOYS, AN/ARR-26 Receiver systems and other associated equipment provide aircraft with a clear picture of the ocean-depths below them. They are part of the continuing contributions of *The Magnavox Company* in aiding the U.S. Navy to combat the growing submarine menace.



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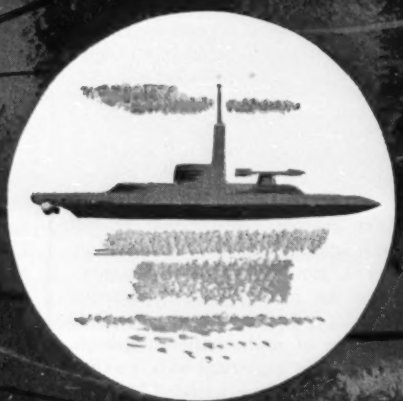

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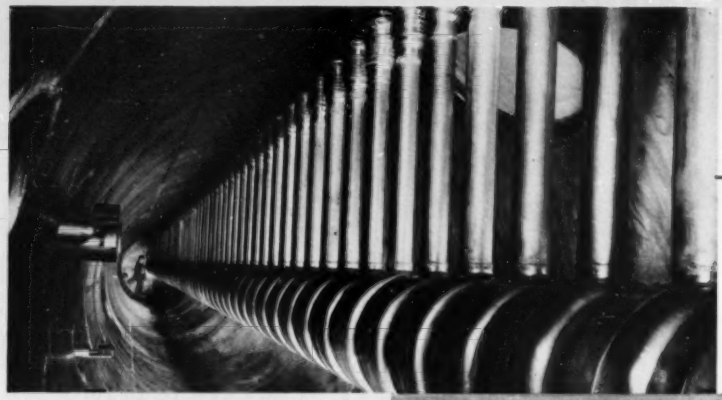

Conference attendees who visit the University of California Radiation Lab on the first field trip, Wesdnesday afternoon, March 4, will see the Hilac (heavy ion accelerator). Trips to local Philco Corp. and Ampex Corp. facilities are also being offered.

"Harbor Queen" will tour San Francisco Bay while the WJCC cocktail party runs its course. After paying the $5.00 tab, bayfarers will get a close look at Golden Gate Bridge, Alcatraz Prison, Treasure Island and other points of interest. Cocktail service aboard.

FIELD TRIPS

University of California Radiation Laboratory, Berkeley

Wednesday afternoon, March 4

From its inception in 1936, UC's Radiation Lab has given much attention to the development of particle accelerators because of the significance of these machines for probing the atomic nucleus. The group of accelerators presently in operation at the laboratory allows a broad coverage of nuclear research instituted and directed by the late Dr. Ernest O. Lawrence. Those making the tour will see the Bevatron, the 184 in. synchrocyclotron, the Hilac (heavy ion accelerator), and the electron linear accelerator.

Philco Corporation Western Development Laboratories, Palo Alto

Wednesday evening, March 4

WDL computing facility located at the new laboratory in Palo Alto (3875 Fabian Way) features a TRANSAC S-2000 installation. The S-2000 is the first large-scale, all transistor, general purpose data processing system. A high speed binary computer with 48-bit word length, it features concurrent operation of the arithmetic unit and input-output devices.

Ampex Corporation Redwood City

Thursday afternoon, March 5

Engineering and manufacturing facilities, including checkout and quality control of Videotape recorders and computer tape handlers, will be shown. Discussion of current state of the art in digital magnetic recording and an indication of future development will conclude the tour. Stereo music demonstration will be arranged for those interested.

WOMEN'S TOURS

Wives who will be accompanying their husbands to the 1959 Western Joint Computer Conference may look forward to as full a schedule of events as the men. The social program drawn up for the ladies attending this year's conference includes fashions, cruising, touring . . . yet allows enough time for the feminine prerequisite of shopping — even more of a "must" when in San Francisco.

One highlight of the program will be a talk by Dr. H. R. J. "Herb" Grosch, (widely famed for his witty presentations) entitled "Never Underestimate the Power of Computers."

Beginning the opening day of the conference, Tuesday, March 3, there is a special tour of the Matson luxury cruise liner "Matsonia" at 3 p.m., no fee. Those wishing to take this tour should make their way to the Matson Terminal, Embarcadero, a little before 3 p.m. The same afternoon, at 5:30 p.m., a cocktail party will take place aboard the "Harbor Queen" while cruising the San Francisco Bay. Departure is from Fisherman's Wharf (five minutes drive from the Embarcadero). Tickets to the cocktail party, $5 per person, must be obtained by husbands when registering.

On Wednesday, March 4, a luncheon and fashion promenade will be held in the Tropical Garden of the Hotel Canterbury at 12:30 p.m. Tickets are $4.50 and can be obtained from the Ladies' Activities Booth in the lobby of the Fairmont.

The last day of the conference, Thursday, March 5, will feature a bus tour of San Francisco sometime in the afternoon (dependent on sufficient attendance; time to be announced later).

There will be a Ladies' Activities Booth in the lobby of the Fairmont Hotel from Monday, March 2, through Thursday, with someone in constant attendance to handle all queries.

MRS. JOANNE TEASDALE
G-E Computer Lab
Women's Activities

Dr. H. R. J. GROSCH
IBM
Guest Speaker

TECHNICAL SESSIONS

1.

Session I-A

Tuesday, March 3
9 a.m. to noon

NEW COMPONENTS AND CIRCUITS

Chairman: C. L. Wanlass, Aeronutronic Systems, Inc.

A MULTILOAD TRANSFLUXOR MEMORY
Speakers: D. G. Hammel, W. L. Morgan, and R. D. Sidnam, RCA

DESIGN AND ANALYSIS OF MAD TRANSFER CIRCUITRY
Speakers: D. R. Bennion and H. D. Crane, Stanford Research Institute

A MAGNETIC MATRIX MEMORY FOR SEMIPERMANENT INFORMATION
Speaker: D. H. Looney, Bell Telephone Laboratories

CARD CHANGEABLE NONDESTRUCTIVE READOUT TWISTOR STORE
Speakers: J. Janik, Jr., J. J. DeBuske, and B. H. Simons, Bell Telephone Laboratories

SQUARE LOOP MAGNETIC LOGIC CIRCUITS
Speaker: E. P. Stabler, Gen. Electric

Session I-B

Tuesday, March 3
9 a.m. to noon

INFORMATION RETRIEVAL AND MACHINE TRANSLATION

Chairman: C. Bourne, Stanford Research Institute

RELATIVE MERITS OF GENERAL PURPOSE AND SPECIAL PURPOSE COMPUTERS AS USED FOR INFORMATION RETRIEVAL
Speakers: A. Opler, N. Baird, Computer Usage Co., Inc.

A SPECIAL LIBRARY INDEX SEARCH COMPUTER
Speakers: B. Kessel, Computer Control Co., Inc. A. DeLucia, Rome Air Development Center

PROGRAMMED INTERPRETATION OF TEXT AS A BASIS FOR INFORMATION RETRIEVAL SYSTEMS
Speaker: L. Doyle, System Development Corp.

A THEORY OF INFORMATION RETRIEVAL
Speaker: C. Walker, Hughes Aircraft Co.

THE ROLE OF USAF RESEARCH AND DEVELOPMENT IN INFORMATION RETRIEVAL AND MACHINE TRANSLATION
Speaker: R. Samson, Rome Air Development Center

2.

Session II-A

Tuesday, March 3
2 to 5 p.m.

COMPUTER COMMUNICATION

Chairman: H. C. Martel, California Institute of Technology

SIMULATION OF AN INFORMATION CHANNEL ON THE IBM 704 COMPUTER
Speakers: E. G. Newman and L. O. Nippe, IBM

A COMPILER WITH AN ANALOG-ORIENTED INPUT LANGUAGE
Speakers: Marvin L. Stein, Univ. of Minnesota, Jack Rose and Donn B. Parker, Convair-Astronautics

AUTOMATIC DESIGN OF LOGICAL NETWORKS
Speaker: T. C. Bartee, Massachusetts Institute of Technology

THE ROLE OF DIGITAL COMPUTERS IN THE DYNAMIC OPTIMIZATION OF CHEMICAL REACTIONS
Speakers: R. E. Kalman, Research Institute for Advanced Study, Baltimore and R. W. Koepcke, IBM

SIMULATION OF HUMAN PROBLEM SOLVING
Speaker: W. G. Bouricius, IBM

Session II-B

Tuesday, March 3
2 to 5 p.m.

EDUCATION AND METHODOLOGY FOR USE OF COMPUTERS

Chairman: G. W. Brown, University of California at Los Angeles

THE ROLE OF THE UNIVERSITY IN COMPUTERS, DATA-PROCESSING AND RELATED FIELDS
Speaker: L. Fein, Consultant, Palo Alto, California

THE RCA 501 ASSEMBLY SYSTEM
Speakers: H. Bromberg, T. M. Hurewitz, and K. Kozarsky, RCA

A PROGRAM TO DRAW MULTILEVEL FLOW CHARTS
Speaker: L. M. Haibt, IBM

A COMPILER CAPABLE OF LEARNING
Speaker: R. Arnold, Michigan State University

3.

Session III-A

Wedneday, March 4
9 a.m. to noon

ACHIEVING RELIABILITY IN OPERATION CONTROL

Chairman: L. Fein, Consultant, Palo Alto, California

SPECIAL PURPOSE ELECTRONIC DATA SYSTEMS
Speaker: W. V. Crowley, RCA

THE RESIDUE NUMBER SYSTEM
Speaker: H. L. Garner, University of Michigan

SYSTEM EVALUATION AND INSTRUMENTATION FOR MILITARY SPECIAL PURPOSE DIGITAL COMPUTER SYSTEMS
Speakers: A. J. Strassman and L. H. Kurkjian, Hughes Aircraft Co.

AUTOMATIC FAILURE RECOVERY IN A DIGITAL DATA PROCESSING SYSTEM
Speakers: R. H. Doyle, R. A. Meyer, and R. P. Pedowitz, IBM

Session III-B

Wednesday, March 4
9 a.m. to noon

LEARNING CONCEPTS AND PATTERN ANALYSIS

Chairman: P. Suppes, Stanford University

A HIGH-SPEED DATA TRANSLATOR FOR COMPUTER SIMULATION OF SPEECH AND TELEVISION DEVICES
Speakers: E. E. David, M. V. Mathews, and H. S. McDonald, Bell Telephone Laboratories.

SOME EXPERIMENTS IN MACHINE LEARNING

Speaker: H. Campaigne, American University

SOME COMMUNICATION ASPECTS OF CHARACTER SENSING SYSTEMS
Speaker: C. C. Heasly, Jr., Intelligent Machines Research Corp.

AN APPROACH TO COMPUTERS THAT PERCEIVE, LEARN, AND REASON
Speaker: P. H. Greene, University of Chicago

4.

Session IV-A

Wednesday, March 4
2 to 5 p.m.

NEW MACHINES AND SYSTEMS
Chairman: M. Montalbano, Kaiser Steel Corporation

THE RCA HIGH SPEED PRINTERS—THE STORY OF A PRODUCT DEVELOPMENT
Speakers: C. Eckel and D. Flechtner, RCA

A DIGITAL COMPUTER FOR INDUSTRIAL PROCESS ANALYSIS AND CONTROL
Speaker: E. L. Braun, Genesys Corp.

THE BURROUGHS 220 HIGH SPEED PRINTER SYSTEM
Speaker: F. Bauer, Electrodata

THE ACRE COMPUTER—A DIGITAL COMPUTER FOR A MISSILE CHECKOUT SYSTEM
Speaker: R. I. Tanaka, Lockheed Aircraft Corporation

THE IBM 7070 DATA PROCESSING SYSTEM
Speaker: J. Svigals, IBM

Session IV-B

Wednesday, March 4
2 to 5 p.m.

COMPUTER APPLICATIONS IN BUSINESS ENVIRONMENTS
Chairman: R. R. Crane, Touche, Niven, Bailey & Smart, Detroit

AN ORGANIZATIONAL APPROACH TO ELECTRONIC DATA PROCESSING
Speaker: G. Fleming, Boeing Airplane Company

DEVELOPING A LONG-RANGE PLAN FOR CORPORATE METHODS AND THE DEPENDENCE ON ELECTRONIC DATA PROCESSING
Speaker: N. J. Ream, Lockheed Aircraft Corporation

A LONG-RANGE ELECTRONIC DATA PROCESSING PLAN FOR A NATIONAL MULTI-PLANT MANUFACTURING COMPANY
Speaker: G. Redmond, Chrysler Corporation

DYNAMIC PRODUCTION SCHEDULING OF THE JOB SHOP OPERATION
Speakers: L. N. Caplan, and V. L. Schatz, General Electric Company

5.

Session V-A

Thursday, March 5
9 a.m. to noon

NUMERICAL ANALYSIS
Chairman: R. D. Levee, University of California Radiation Laboratory

SURVEY OF NUMERICAL ANALYSIS
Speaker: G. E. Forsythe, Stanford University

MORE ACCURATE LINEAR LEAST SQUARES
Speaker: R. Von Holdt, University of California Radiation Laboratory, Livermore

THE CORDIC COMPUTER
(three papers)
The Cordic Transcendental Computing Technique
Speaker: J. E. Volder, Convair

Implementation of Coordinate Rotation and Other trigonometric Function Algorithms by Cordic
Speaker: D. R. Clutterham, Convair

Decimal-Binary Conversions in CORDIC
Speaker: D. H. Daggett, Convair

MONTE CARLO TECHNIQUES APPLIED TO STATISTICAL MECHANICS
Speaker: W. W. Wood, Los Alamos Scientific Laboratory

REAL-TIME DIGITAL ANALYSIS AND ERROR COMPENSATING TECHNIQUES
Speaker: W. Ito, Minneapolis-Honeywell Regulator Company

AUTOMATIC DIGITAL MATRIC STRUCTURAL ANALYSIS
Speakers: B. Klein and M. M. Chirico, Convair

PROBLEMS OF THE FUTURE
Speaker: S. Ulman Los Alamos Scientific Laboratory

Session V-B

Thursday, March 5
9 a.m. to noon

"BLUE-SKY" SESSION
Chairman: Dr. Louis Ridenour, Lockheed Aircraft Corp.

A NEW APPROACH TO HIGH-SPEED LOGIC
Speaker: W. D. Rowe, Westinghouse Mfg. Corp., Buffalo, N.Y.

EXPERIMENTS IN INFORMATION RETRIEVAL
Speaker: Robt. Cochran, G. E. Co., Phoenix, Ariz.

COMMUNICATION ACROSS LANGUAGE BARRIERS
Speaker: Wm. F. Whitmore, Bureau of Ordnance, Navy Department

SYMBOLIC LANGUAGE TRANSLATION
Speaker: Eugene C. Gluesing, Remington Rand Univac Division Sperry-Rand Corp., St. Paul.

NEW HORIZONS IN COMPUTER TECHNOLOGY
Speaker: Howard Aiken, Director, The Computation Laboratory, Harvard University

6.

Session VI-A

Thursday, March 5
2 to 5 p.m.

NEW APPLICATIONS OF COMPUTER TECHNOLOGY
Chairman: H. D. Huskey, University of California

A GENERALIZED SCANNER FOR PATTERN AND CHARACTER RECOGNITION STUDIES
Speakers: L. A. Kamentsky and W. H. Highleyman, Bell Telephone Laboratories

FILE SEARCHING USING VARIABLE LENGTH KEYS
Speaker: R. De La Briandais, U. S. Naval Ordnance Laboratory

PROGRAM DESIGN TO ACHIEVE MAXIMUM MACHINE UTILIZATION IN A REAL TIME COMPUTING SYSTEM
Speaker: A. F. Rosene, Sylvania

PATTERN AND CHARACTER RECOGNITION SYSTEMS — PICTURE PROCESSING BY A NET OF NEURON-LIKE ELEMENTS
Speaker: L. A. Kamentsky, Bell Telephone Laboratories

Session VI-B
Thursday, March 5
2 to 5 p.m.

PHILOSOPHY AND RESPONSIBILITY OF COMPUTERS IN SOCIETY
Chairman: R. W. Tyler, Center for Advanced Study in the Behavioral Sciences, Stanford.

SOCIAL RESPONSIBILITY OF ENGINEERS
Speaker: F. Wood, IBM

EMERGENCY SIMULATION OF THE PRESIDENT OF THE UNITED STATES
Speaker: L. Sutro, Datamatic

CAN COMPUTERS HELP SOLVE SOCIETY'S PROBLEMS
Speaker: J. Rothstein, Edgerton, Germeshausen & Grier, Inc.
MEASUREMENT OF SOCIAL CHANGE
Speaker: R. L. Meier, University of Michigan

7.

Session VII
Thursday, March 5
2 to 5 p.m.

ANALOG SIMULATION
Chairman: J. E. Sherman, Lockheed Aircraft Corporation
SIMULATION OF SAMPLED DATA SYSTEMS USING ANALOG-TO-DIGITAL CONVERTERS
Speaker: M. S. Shumate, Space Technology Laboratories

A TRANSISTORIZED ANALOG MEMORY FOR FUNCTIONS OF TWO VARIABLES
Speakers: P. C. Sherertz, and L. E. Steffen, Convair

A TIME-SHARING ANALOG COMPUTER
Speaker: J. V. Reibing, Jr., Westinghouse Electric Corporation

COMPUTERS — THE ANSWER TO REAL-TIME FLIGHT ANALYSIS
Speaker: G. Hintze, Chief, Flight Simulation Laboratory, White Sands Missile Range.

Special Session A
Tuesday, March 3
9 a.m. to noon

INDUSTRY'S ROLE IN SUPPORTING HIGH SCHOOL SCIENCE PROGRAMS
Chairman: Dr. Paul Hurd. Associate Professor of Education, Stanford University

Two case histories will be presented of current experiments toward enlarging the technical exposure of high school students through cooperation with industry.

Special Session B
Tuesday, March 3
2 to 5 p.m.

INFORMATION RETRIEVAL AND MACHINE TRANSLATION
Chairman: C. Bourne. Stanford Research Institute

COMPUTING EDUCATED GUESSES
Speaker: E. S. Spiegelthal, General Electric Company

A MEMORY OF 314 MILLION BITS CAPACITY WITH FAST AND DIRECT ACCESS — ITS SYSTEMS AND ECONOMIC CONSIDERATIONS
Speakers: N. Bishop, Time, Inc., and A. Dumey, Consultant

INFORMATION RETRIEVAL ON A HIGH SPEED COMPUTER
Speakers: A. Barton, V. Schatz, L. Caplan, General Electric Co.

THE NEXT 20 YEARS IN INFORMATION RETRIEVAL: SOME GOALS AND PREDICTIONS
Speaker: C. N. Mooers, Zator Co.

Special Session C
Wednesday, March 4
9 a.m. to noon

MILITARY APPLICATIONS
Chairman: H. Silverstein, Department of the Army, Washington, D.C.

DRAFTING DIGITAL COMPUTERS INTO TACTICAL COMBAT
Speaker: Capt. A. B. Crawford, Jr., Fort Huachuca, Arizona

DATA TRANSMISSION EQUIPMENT CONCEPTS FOR FIELDATA
Speaker: Capt. W. F. Luebbert, Fort Monmouth, New Jersey

A HIGH ACCURACY — REAL TIME DIGITAL COMPUTER
Speaker: W. J. Milan-Kamski, EPSCO

THE MAN — COMPUTER TEAM IN SPACE ECOLOGY
Speaker: J. McLeod, Convair; J. Stroud, Navy Electronics Lab.

EXHIBITORS and EXHIBIT AREA

Aeronutronic Systems, Inc. **39**
2701 Halladay Street
Santa Ana, Calif
high-density random access magnetic disc file
electronic digital input-output equipment
FLIDEN—flight data entry system
solid state electronic digital components
large-scale military digital computer systems

AMP Inc. **2, 3**
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Ampex Corporation **102, 103, 104**
934 Charter Street
Redwood City, Calif.
digital magnetic tape handlers, FR-300, FR-400
automatic tape degausser
magnetic tape

Beckman Instruments, Inc. **302, 303**
Berkeley Division
2200 Wright Avenue
Richmond 3, Calif.
Model 1132 EASE Electronic Computer, including:
receptacle control unit with oven
elapsed time and preset control unit
high accuracy function generator channel
function generator unit

Bendix Computer Division **51, 52**
Bendix Aviation Corporation
5630 Arbor Vitae Street
Los Angeles 45, Calif.
magnetic tape unit—MTA-2
G-15 computer

E. L. Berman Company **41**
450 Ninth Street
San Francisco, Calif.

Bryant Computer Products Division . . . **18**
P. O. Box 620
Springfield, Vermont
all purpose magnetic storage drum—#512
military type shipborne magnetic storage drum assembly

C. P. Clare & Company **6**
6047 Hollywood Blvd.
Los Angeles 28, Calif.

Collins Radio Company **53**
2700 West Olive Avenue
Burbank, Calif.

Computer Control Company, Inc. . . **49, 50**
2251 Berry Avenue
Los Angeles 64, Calif.

Data Instruments Division of **44**
Telecomputing Corporation
12838 Saticoy Street
North Hollywood, Calif.
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magnetic tape storage unit—220
data processing service bureau

Electronic Associates, Inc. 54
Long Branch, New Jersey

Electronic Engineering Co. of Calif. .. 101
1601 East Chestnut St.
Santa Ana, Calif.
computer language translator—model ZA-100

Ferranti Electric, Inc. 7, 8
95 Madison Avenue
Hempstead, New York
photo-electric, solid state, tape reader—TR5
photo-electric, solid state, tape reader—196
high speed photo-electric tape reader-TR7

Friden, Inc. 22, 23
2350 Washington Avenue
San Leandro, Calif.
flexowriter with tab card reader
add-punch machine
computyper
teledata

General Electric Company 301
Light Military Electronics Dept.
600 Main Street
Johnson City, New York
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Hughes Aircraft Company 28, 29
Florence & Teale Streets
Culver City, Calif.
airborne digital computer—model IV
memo-scope oscilloscope—model 104
complete line of semiconductors
thermal relay demonstration

International Business Machines Corp. 32, 33, 34
590 Madison Avenue
New York 22, N. Y.

Laboratory for Electronics 5
1079 Commonwealth Ave.
Boston, Mass.
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Librascope, Inc. 16, 17
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409 North Fair Oaks Ave.
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Pasadena, Calif.
X-Y recorder—model 2A
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Remington Rand Division of Sperry Rand Corp. 45, 46, 47, 48
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315 Fourth Ave.
New York 10, N. Y.

Rese Engineering, Inc. 1
731 Arch Street
Philadelphia 6, Penna.
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Royal McBee Corporation 14
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Port Chester, New York
electronic digital computer LGP-30
photo electric reader and high speed punch model 342

Soroban Engineering, Inc. 13
Box 1717
Melbourne, Florida
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comparator equipment
paper tape perforator—model GP-2
anemometer reading head

Sprague Electric Company 27
North Adams, Mass.
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pulse transformers
Dynacor bobbin cores
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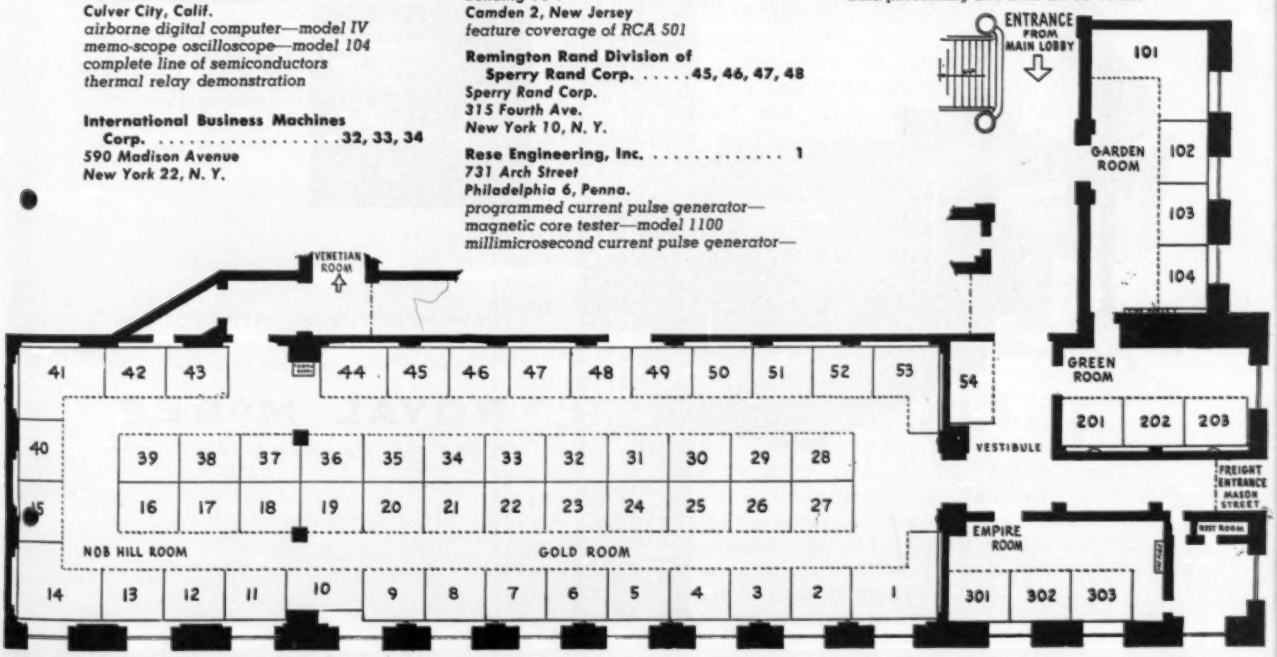
San Diego 12, Calif.

Tally Register Corporation 42, 43
5300 14th Avenue, N.W.
Seattle 7, Washington

Telemeter Magnetics, Inc. 15, 40
2245 Pontius Avenue
Los Angeles 64, Calif.
ferrite core arrays
core storage buffers

The Thompson-Ramo-Wooldridge Products Co. 19, 20
P. O. Box 90067, Airport Station
Los Angeles 45, Calif.
RW-300 digital control computer

John Wiley & Sons, Inc. 30
440 Fourth Avenue
New York 16, N. Y.
a complete selection of books on computers, data processing and their allied fields.



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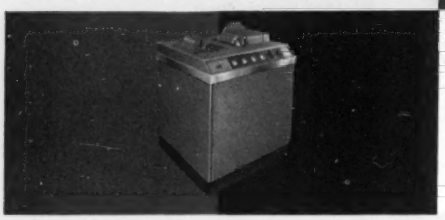

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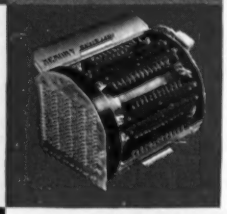

Complete format control. Alpha-numeric input-output via keyboard or punched paper tape. No additional equipment needed to operate.

For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N. Y.

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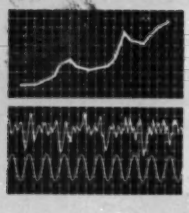

DATAMATION *in business and science*

PHILCO, IBM DEVELOP 'BATTLE' SYSTEMS

Assisting the successful Army commander of the very near future will be a sizeable contingent of data processing specialists. This position gained credence recently when both Philco and IBM announced development of battlefield data processing systems. Philco data processors will be used for combat computations, control data processing and support data processing. A million dollar-plus contract to design and build the first two units, Basicpac and Logicpac, has been awarded Philco's Government and Industrial Division by the Army. Logicpac will have a larger core storage and greater input-output capabilities but otherwise the processors are the same. The IBM equipment, air-transportable, will provide battle information on such changing conditions as intelligence, logistic support, fire power and troop strengths. Development work on two solid-state mass information processing systems has been started by IBM under a $3,858,970 Army contract. One of the IBM units will be designed to receive, store, and retrieve battle information via remote input and output units. The second will be an experimental data processor which will assist commanders in coordinating operations for field army computers.

DR. MARTIN KLEIN HEADS NEW FRANKLIN DIV.

Franklin Electronics, Inc., Bridgeport Penna., has formed a new West Coast division in Van Nuys, California. The Communication and Controls Division will be headed by the noted computer authority, Dr. Martin L. Klein. Dr. Klein joins Franklin after serving as vice president and director of research with the KinTel Division of Cohu Electronics.

TRANSISTORIZED M-H 800, RCA 501 ANNOUNCED

Two new transistorized data processing systems have been unveiled within the last 90 days. The Honeywell 800, developed and to be produced (first deliveries—third quarter, 1960) by Minneapolis-Honeywell's Datamatic Div., features automatic parallel processing with traffic control (central processor communicates simultaneously with as many as eight input-output devices) and multi-program control (800 divides into as many computers as there are jobs to be run, up to eight). Maximum input-output rate from tape 96,000 decimal digits/sec.; internal transfer rate is 2,000,000 decimal digits/sec. . . . The RCA system combines a transistorized computer and transistorized input-output equipment. Firm states that first installation will be made for Navy's Bureau of Ordnance in May or June of this year and that approximately 15 systems have been sold or leased. The 501's speed is attributed to a recording system for tape memory units which permits messages of variable lengths to be recorded, ability to read and act on data with tape running in either direction, and a "time-sharing" system which enables unit to do several operations simultaneously.

MAN–MACHINE RELATIONSHIPS

by MORTIMER TAUBE
President, Documentation Inc.

Several years ago, under the leadership of Commander George Hoover, the Office of Naval Research inaugurated a program for the redesign of airplane cockpits. There have been many such programs, but what distinguished this one was a radical (in the root sense of basic) approach to the problem of man-machine relationships. The general account of this program and its accomplishments is contained elsewhere.(1) This paper will be concerned only with its concept of man-machine relationships and the light which this concept sheds on the validity of the endeavors to design machines to simulate the behavior of the human brain. It will be shown that the proper man-machine relation is one of complementation and augmentation, not simulation.

The human organism and its brain respond consciously to limited spectra of the world of radiation in which they function. Hence it is theoretically and practically important to design receptors and processors which can react to and derive information from portions of the radiation spectra to which the human organism is insensible. When this type of information has a steady or predictable character, and constitutes the total data for action, the machine can be programmed to respond to it by taking suitable action. If the information processed by the machine must be integrated with actions in ways which are unpredictable, then the machine function terminates in a display to which a human brain can react. The complex man-machine relationships of complementation, substitution, augmentation are not varieties of simulation. It will be shown that recent speculation concerning the simulation of human brains by machines is devoid of interest and does not contribute to fruitful understanding of man-machine relationships.

If a machine is to simulate the behavior of a human brain, the designer of the machine must have a good notion of the behavior which is being simulated. That is to say, it is an initial requirement that any such enterprise specify as exactly and as completely as possible those activities or functions of the brain which are to be simulated, imitated, or even surpassed. It is unfortunately true that much of the theoretical and experimental work in this field has neglected this requirement and consequently has found itself mired in the classical vicious circle:

1. A machine is proposed or constructed to simulate the human brain (which has not been described).
2. The characteristics of the machine which are carefully described are then stated to be analogous to the characteristics of the brain.
3. It is then "discovered" that the machine behaves like a brain. The circularity(2) consists in "discovering" what has already been posited.

To avoid this circularity, it is necessary to begin with some concept of the brain's activities or some definition of its functions. Such a definition can then provide an empirical measure of the degree to which any machine simulation of the brain is successful.

However, it must be recognized that it is not a simple matter to describe either the structure or function of the brain in such a way as to establish a standard of activities which are to be imitated or surpassed by a machine. And it is at this point that some help can be derived from the basic notions of Commander Hoover's program. Very much simplified, these notions can be stated as follows: For the first 20 years of his life an airplane pilot grows up in an earth-bound environment. The organs which convey mes-

1. Douglas Aircraft Company, Inc. Engineering Department, El Segundo, California. Integrated Instrument Development. Contract No. NONR 1076(00) Report No. ES-26040 13 Sept., 1955.

2. "It has become a popular sport in the past few years to describe brain functions in computing-machine terms and computing-machine functions in human behavioral terms and to get a good deal of satisfaction out of the notion that while it may take a year or two yet, we will certainly be able to understand mental function in computer terms before too long and will shortly thereafter be able to design really heavy-duty brains with greater speed and capacity, and increased reliability.
"While I am all in favor of such enthusiasms, on the basis that nothing succeeds like success, I believe I should risk the disapproval of some members of this group of investigators by pointing out a type of circular reasoning which has been preva-

sages to his brain and the brain itself are biologically specialized to function in such an environment. Of even greater significance is the fact that these organs evolved through millions of years by a process of natural selection to perform certain activities necessary to the survival of the species man in his natural environment.

If this pilot is taken 10 miles into space and propelled through space at speeds of 1001 miles an hour, he finds himself in an unfamiliar and biologically unsuitable environment. His sense organs no longer pick up the significant stimuli; and what is picked up conveys little or no useful information to his brain. Under such circumstances, the pilot is at first supplied with instruments; but as the number and variety of such instruments multiply and the pilot is called upon for faster and faster reaction speeds, the environment of instruments also becomes unsuitable for the proper functioning of the brain and its sensors. Something can be done at this point by attempting to re-train the pilot; that is, to overcome and modify the environmental adjustments of his first 20 years. But training which is designed to overcome several million years of evolutionary adjustments does not afford a very hopeful prospect.

There is however, another method, namely the use of "sensors" and "instruments" to create or simulate in the cockpit an environment which is suitable for the biological organism it contains.

Consider the case of a man entering a dark room or a cave. If the man could train himself to orient himself and move around by picking up infrared, acoustic, and radio waves, he could function in such an environment; but how much simpler it is to turn on the lights and thus create a natural environment for the awake biological organism. It might be possible to train chickens to lay eggs in the dark instead of sleeping, but it is much simpler to provide light artificially so that the chickens continue their normal daylight function in a "daylight" environment.

definition of the brain

From these considerations it is possible to derive a fairly simple and straightforward functional definition of the brain: The brain is that organ of the body which processes information received from a relatively stable environment (including the body itself) in order to secure successful behavior of the organism in relation to its environment. More concretely, the eye which conveys certain information to the brain enables the brain to distinguish between an open door and a closed door, so that in one case we walk through, and in the other we stop before bumping our noses.

The essential character of this definition is that it recognizes the pragmatic, biological character of the brain. It is to be sharply distinguished from any definition or description of the brain which neglects biological function or considers it a minor characteristic of a nonbiological entity. For example, a clinical thermometer is used in a biological environment but it itself is not usually considered to be a biological organism. A computer may also be used in a biological environment without thereby becoming a biological organism.

It is true that biological organism will have other characteristics which can be characterized as mechanical, physical, chemical, electrical or even logical; but by emphasizing the brain's role in the adaption and survival of the organism and species, the problem of "simulation" of the brain by a machine is set in a new perspective, at least a perspective which is almost uniformly ignored by the coterie of computer enthusiasts.

The term "simulation" which is encountered in man-machine discussions is almost as troublesome as the term "brain." "Simulation" obviously admits of degree; more importantly it may be partial or abstract. For example, a pound of cheese can be simulated by placing a pound piece of metal opposite it on a scale. That is, the weight of the cheese is simulated but not its flavor, aroma or nutritive properties. It may be argued that the weight is the "essential" character of the cheese and that when the weight has been simulated all other properties may be disregarded as trivia.

It is unfortunately true that most of the literature on the simulation of brains by machines partakes of this character. The author selects one characteristic of the brain (or sometimes even posits one) which he regards as essential. He then points out that his machine can simulate the characteristic he has selected. It is reasonable to suspect that the choice of brain characteristic to be simulated is motivated by a prior knowledge of what the machine can do — and again the cozy but vicious circle is established.

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lent in their arguments. This is the fault of using a disguised form of an hypothesis to prove the hypothesis.

"To illustrate my point, I would like to tell you a true story about one of my colleagues whom I shall not name. This gentleman, a professor of considerable fame, was waiting to listen to a fight on the radio but because the fight was delayed in starting, he idly turned to the university station and heard a lecture already in progress with which he became very impressed, and to which he listened most attentively. Because he agreed so completely with the speaker's point of view, he availed himself of the invitation at the end of the lecture to send a postcard for a copy of the lecture. He was considerably taken aback when he received his copy to find a note attached asking whether he had lost the original copy as he himself had recorded the lecture on tape several months ago for later broadcast.

"By analogy with this story, I believe we have fallen into the trap of describing some brain functions in terms of present-day computer components and are then delighted to discover machine-like components in our description of brain function."

Schmitt, O. H. "Symposium: The Design of Machines to Simulate the Behavior of the Human Brain." p. 244. *IRE Transactions on Electronic Computers.* December, 1955. p. 240-255.

One may wonder why reputable scientific journals publish material of the sort and why it should have an audience beyond the readers of the Sunday supplements. The answer to this question will be presented below. But it is necessary in the first instance to establish the basic importance of the above definition by subjecting it to an examination within the context of some formal discussion of brain simulation. The problem here is to select some formal discussion which can be considered both typical and representative of the highest level yet attained by discussions of the subject.

At the 1955 IRE National Convention, the Professional Group on Electronic Computers sponsored a symposium on "The Design of Machines to Simulate the Behavior of the Human Brain." The panel members represented the top echelon of workers in this field and it can be presumed that in this symposium most, if not all, of the crucial issues of simulation were introduced. In any case this symposium will be accepted as representing "the state of the art" or the "state of thinking" on the topic of machine simulation of brains, and most subsequent references will be to this text.

One of the first points made clear in the symposium was that a distinction must be made between simulation of structure and simulation of function.[3] Furthermore, once this distinction had been made, the participants came to fairly general agreement that computers could not be considered structurally similar to human brains, and that the simulation of brain structure by a machine structure is not a very promising enterprise. In fact, after Dr. Schmitt, the neurophysiologist on the panel, noted that:

> "In all probability the central nervous system including its memory and computing functions is a widely distributive statistical time-place-state system where memory of a particular event is smeared out over some millions of cells and these same cells simultaneously hold many millions of other memory traces."[4]

Dr. Minsky commented that "no one seems to have been able to [build or suggest a model to] indicate how such a thing might work."[5] Even earlier in the discussion Dr. Oettinger noted that "many machines of the future will continue to have only a functional resemblance to living organisms."[6] And Dr. Maron suggested that "only similarity of inputs and outputs be considered and that computers or brains be looked upon as 'black boxes' which might have no similarity of structure or components."[7]

It is true, as Dr. Schmitt indicated, that some computer enthusiasts have looked for structural analogs between the wire networks of electronic computers and the nerve networks of living organisms, and have made much of the fact that nerve impulses seem to be "electrical" in character. But Turing has noted that:

> "The fact that Babbage's Analytical Engine was to be entirely mechanical will help us to rid ourselves of a superstition. Importance is often attached to the fact that modern digital computers are electrical, and that the nervous system also is electrical. Since Babbage's machine was not electrical, and since all digital computers are in a sense equivalent, we see that this use of electricity cannot be of theoretical importance."[8]

It seems then that we may dispense with "structural" simulation – with Frankensteins, robots, and the whole phantasmagoria of artificial men made out of artificial protoplasm, and confine our attention to simulation of function; but here we note a general hiatus in the symposium. While everyone seemed to agree that the interesting and important kind of simulation is simulation of function, there was no discussion or attempt to specify the functions which are to be simulated.

For the past six years, Mortimer Taube has been president of Documentation Incorporated. He formerly was deputy director of the Technical Information Service of the Atomic Energy Commission; and, before that, chief of the Science and Technology Project at the Library of Congress. The present system of cataloging, indexing, abstracting, and disseminating information concerning Government research reports now followed by ASTIA, OTS, AEC, etc., is largely his creation. For his work in this connection, the Special Libraries Association presented him with their first professional award in 1952 for "pioneering in documentation." Since that time, in addition to several volumes of theoretical studies on information storage and retrieval, he has made many contributions to practice. He holds a Ph.D. in philosophy from the University of California and has studied at Rutgers, the University of Chicago, and Harvard University. His training in philosophy and logic and his concrete experience with the design and operations of systems gives him a special competence in problems of man-machine relationships.

3. Oettinger, A. G., Ibid. p. 241-2
4. Ibid. p. 251
5. Ibid. p. 251
6. Ibid. p. 242
7. Ibid. p. 249
8. Turing, A. M. "Can a Machine Think?" *The World of Mathematics.* V. 4, p. 2104. New York, Simon and Schuster, 1956.

It certainly does not make much sense to say that the function of the brain is to play chess or translate languages and that chess playing machines and translation machines are thereby successful simulations of the human brain. Presumably, those machine designers or theorists who occupy themselves with chess playing and translation think of them as activities which illustrate some underlying functional competence in man, which competence is to be simulated by a machine. The competence which underlies such activities may be called thinking; and one may then say that the function of the brain is thinking and that a mechanical thinking machine simulates the function of the brain. But this too is nonsense – the brain doesn't think any more than lungs breathe – it is man which does both. Furthermore, in the same sense that the brain thinks, it perceives, wills, feels, imagines, hates, loves, etc. Is the machine simulation of the brain also to cover these functions?

In short, to define the brain by attributing to it the function of "thinking" is merely to state a problem. How do we recognize thinking and how do we know that any given brain or machine is thinking? This is not a specious nor captious question. At the 3rd London Conference on Information Theory, one of the participants stated his position as follows:

> "We may refer the question 'Can a machine induce?' to the general question 'Can a machine do what a man does when he says he is thinking?' The affirmative answer offered by the Italian Operational School to either question should then be connected with the last (and not with the first) of the following four combinations: (a) man thinks, machines think; (b) man thinks, machines do not think; (c) man does not think, machines think; (d) man does not think, machines do not think."(9)

Here is simulation of function with a vengeance; according to behavioristic or positivistic metaphysics, nothing thinks – men just move as determined by their inputs – and a machine can certainly be built to simulate any described movement of the human body.

The simulation of men by machines based upon their like inability to think is a kind of metaphysical nonsense which has been noted above and which must now be directly faced. A large part of the acceptance, or patience, which is exhibited towards the literature of machine simulation of the human brain can be attributed to a cultural lag, the fact that the mechanistic philosophy of the nineteenth century is today's "common sense." If, ultimately and in the end, man is nothing but a machine, in the sense in which Descartes thought animals to be machines (Descartes exempted man from mechanism on theological grounds) then the simulation of human brains by machines can be interpreted as the simulation of a machine by a machine.

This metaphysical position even intrudes itself into the symposium. Thus Dr. McCulloch introduces the symposium with the statement that "Since nature has given us the working model, we need not ask, theoretically, whether machines can be built to do what a brain can do with information."(10) And Dr. Oettinger follows soon after with:

> "Thus, if our goal is the design of more reliable, more adaptable machines capable of uninterrupted operation over periods of many decades, then living organisms provide, so to speak, an existence theorem guaranteeing the reality of this goal."(11)

In both of these statements there is a hidden metaphysical

DEFINITIONS

Simulation *refers to the act of imitating or feigning an appearance contrary to reality. The simulation of a brain by a machine refers to the imitation of a brain by a machine. In principle, such imitation can only be partial, since it implies that two different objects are alike or resemble one another with respect to subsets of their characteristics or functions. That is, simulation implies there are two things which are identical in some respects and different in others. Hence, "complete simulation" is a contradiction in terms like "real imitation."*

Augmentation *refers to the enlargement or increase of a situation or object. Thus a man may augment the power of a machine or a machine may augment the power of a man. The notion implies that a total man-machine system exhibits an increase of power, capability, etc., over the man by himself or the machine by itself.*

Substitution *refers to the replacement of one thing by another. In the man-machine relationship, it refers to the replacement of a human action by a machine action or vice versa. The notion of substitution does not imply the identity of the substituents.*

Complementation *refers to the act of supplying a deficiency of one of two mutually completing parts. Hence, when it is said that the man complements the machine or vice versa, a complete man-machine system is implied.*

9. Somenzi, Villorio. "Can Induction be Mechanized?" p. 227 *Information Theory*. 3rd London Symposium, London, Butterworth, 1956.
10. *Op. Cit.* p. 240
11. *Ibid.* p. 241

assumption regarding the ultimate mechanical identity of biological organisms and machines. Otherwise the existence of a biological organism can never be regarded as a proof or an existence theorem that a machine can function exactly like a biological organism. It is true that, according to much modern philosophy and physical theory, at the subatomic level the distinction between living organisms and machines disappears; but the categories of explanation at this level are no longer mechanical and materialistic, but organic.

It is certainly more desirable to avoid metaphysical controversy on this topic and to accept the prima facie distinction between machines and living organism. In any case, when the computer theorist refuses to accept the empirical account of the biological function of the brain and takes refuge in materialistic metaphysics because he cannot state how machines are to simulate such a function, his performance is no better and probably worse than the average man's sudden surge of religious faith which he feels when he finds the hard facts of experience indifferent to his heart's desire.

It can now be seen why the pragmatic definition of the function of the brain in biological terms has a therapeutic value. To simulate the functions of the brain by a machine, is to make a machine which processes information in order to secure the survival of a biological organism of which it is an integral part, not to mention the species to which the biological organism belongs. Until someone has some specific ideas about how to build a machine of this type, it seems advisable to stop talking about mechanical simulation of the human brain.

We may return, at this point, to the notion of man-machine relationships introduced in the opening paragraphs of this article. Once the barren notion of simulation is eliminated, it becomes possible to investigate the truly important question, namely, how the machine may extend the function of the brain by processing and transforming information which cannot be handled by the brain so that the brain can handle it. This is another way of saying that machines can convert an environment in which the brain cannot function, into one in which it can function. (It is appropriate to note that the word "simulation" first entered into the machine picture with reference to the use of a machine to simulate an environment, as in a Link trainer.) Consider again the simple case of a thermometer. The brain and its senses lack the ability to measure the rate of thermal radiation. Hence its own judgments of hot and cold are apt to be quite vague and confined both to narrow limits and to large intermediate jumps. The thermometer, on the other hand, can respond to thermal radiation by changing the arrangement of the light rays reflected from it. The brain can react very specifically to these light rays which it processes to arrive at the perception of the coincidence of a line of color with a row of numbers. The essential fact here is that the machine handles messages which the brain cannot.

The role of the thermometer (in this example a clinical thermometer) may be extended by eliminating the numbers on it and substituting a series of phrases at appropriate intervals: Go to work; Rest; Go to bed; Call a doctor; Call an ambulance. It might even be possible to connect sensors to the thermometer which would convert a particular reading to the manipulation of a telephone dial to call the doctor. But if the high reading on the thermometer were attributable to a vaccination then the programmed behavior would be wrong. At this point a human brain would be required to integrate all the information in the environment in terms of special experiences and purposes of the human organism.

Another simple illustration can be drawn in terms of a man sitting in a room aware with certain narrow limits, of thermal radiation, acoustical radiation, and optical radiation. He is surrounded, of course, by radiation to which he is insensible. Suppose at a certain time a radio is introduced into the room, or more spectacularly, a television set. The television set is a device which can convert radiation to which the human organism does not consciously respond to familiar sights and sounds to which it can and does respond. Because broadcasting would not occur if there were no radios or television sets, we sometimes talk as though broadcasting were a process of sending messages to a receiver; and we assume that the messages would not be in the environment if the receivers weren't present. Actually the messages are in the environment. We are at all times enveloped in radiation to which we are insensible from all over the earth, from heavenly bodies, and from the very walls around us.

Here, then, is a meaningful task for machine builders with an understanding of the function of the human brain and the function of machines in the man-machine relationship. The brain and its senses are highly specialized for the purpose of survival in an environment, with limited variability. We wish to enable man to function high in space, in the depths of the sea, when he moves at tremendous speeds, when he is encased in an armored tank, etc. Under such circumstances the messages the brain receives from its environment cease to convey information of value, that is, information in terms of which the man can insure his survival and carry out his purposes. A man so placed is desperately dependent on machines to convert the unfamiliar to the familiar; to respond to radiation from distant objects before they can be picked up by human senses; to utilize radiation bands beyond the limited human range in order to derive information about the environment; and to process such information into a form which the man finds familiar and meaningful.

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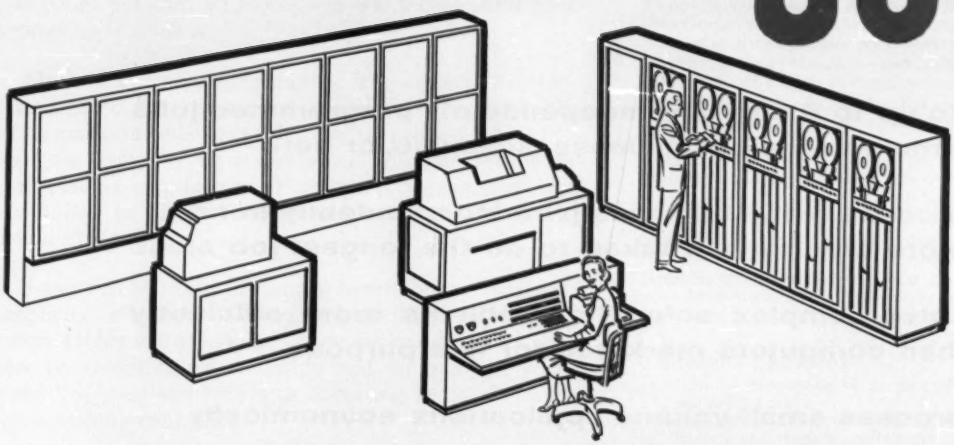

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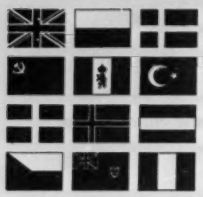

DATAMATION *abroad*

LONDON SHOW SUCCESS, 40,000 ATTEND

More than 40,000 people from 41 countries visited the Computer Exhibition and Symposium which closed in London, England on December 4 after a six-day run. Forty-three exhibitors displayed $23 million in equipment. Important trends that were noted included the introduction of transistors and printed circuit methods in building European computers, and improved memory systems. The input-output "bottleneck" was shown to have been reduced somewhat and one prototype printer manufactured by Rank Precision, will, it is claimed, be at least equal to similar U.S. equipment. Along with the exhibition the symposium dealt with the practical application of computers to everyday business problems. Bankers, steel makers, production engineers and government and state industry officials were among those who presented 23 papers. Vernon Roberts, exhibition chairman, summed up: "The attendance and the interest shown exceeded all our expectations."

JAPANESE GOVT. HIRES TYPHOON FORECASTER

Upon order from the Japanese government, IBM has delivered and will install a 704 in the Japanese Meteorological Agency in Tokyo. Japanese weather experts are acutely interested in long range forecasts for the fearsome typhoons which plague the island chain. Programs for instructing the 704 were developed by members of the Meteorological Agency. These technicians had never seen a large-scale data processing system. The programs were flown to the United States and tested by other agency members in this country on fellowship grants and by IBM technicians. A 704 has been used by the U.S. Weather Bureau at Suitland, Md., to predict weather conditions for the northern hemisphere.

EDP APPLICATIONS DIFFER IN EUROPE'S BANKS

European banking problems differ from those in the United States to such an extent that computers, although they will be needed in banks abroad, will be used in different applications. This fact was brought out last November when the Professional Association of French Banks was host to bankers from West Germany, Austria, Switzerland, Italy, Spain, Belgium, the Netherlands, Great Britain, Denmark and Sweden. It was noted that the number of checks handled in European banking is too insignificant to warrant computer handling. Contrary to U.S. banks however, bills of exchange, called "reimbursements" in Europe, will have to be processed automatically.

UK AEA GETS THIRD 231R PACE COMPUTER

Electronic Associates has sold a model 231R PACE analog computer to the United Kingdom Atomic Energy Authority near Lancashire, England. This sale represents the third such system sold in the U.K. to that country's AEA by the American firm. It also represents the 23rd sale of a PACE system in Western Europe.

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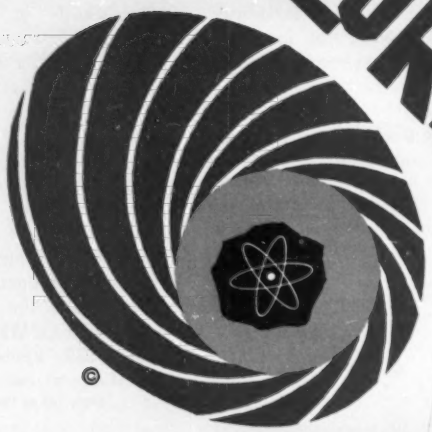

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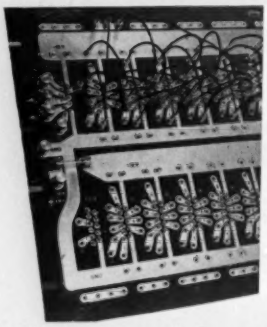
mag core logic breadboard

This unit consists of up to 23 magnetic core logical elements (CTL-50 or CTL-100) plus drivers on a printed circuit

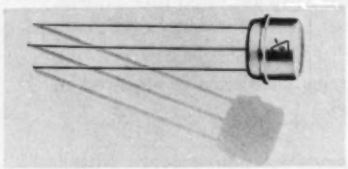


panel suitable for mounting in a standard 19 in. rack. Dimensions are 19 in. wide, 10½ in. high and 1¾ in. deep. All logical connections are brought out to plug-in terminals for patch-cord connection. Any desired logical connection can be set up for experimental evaluation of a proposed logical system or for training in magnetic core logic. Patch-cords are supplied with the breadboard. For information write DI-AN CONTROLS, INC., 40 Leon Street, Boston, Mass., or use card.

Circle 100 on Reader Service Card.

transistors

Now available are hermatically sealed NPN germanium-alloy transistors designed for data-processing applications

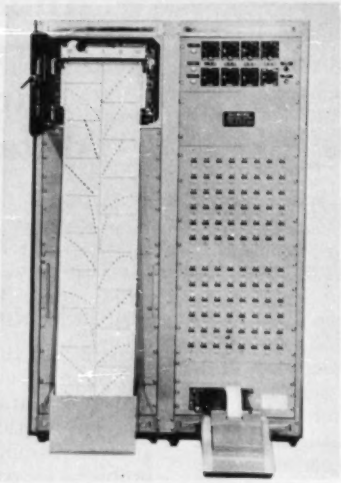


where core drivers operate up to 400 ma current levels. Designated types 2N576 and 2N576A, both transistors feature a junction temperature of 100°C, total dissipation of 200 mw and collector current of 400 ma. Type 2N576 has a 20-volt collector to base voltage. Type 2N576A has a collector to base voltage of 40 volts. Both types employ a JETEC TO-5 case with the base connected to the case internally. For information write SYLVANIA ELECTRIC PRODUCTS, INC., Semiconductor Division, 1740 Broadway, New York 19, N. Y. or use card.

Circle 101 on Reader Service Card.

autographic plotter

Model 114 is a multi-channel recording and plotting instrument for use with strain gauge, thermo couple or



millivolt inputs. It automatically receives and plots each channel on an individual graph so that test personnel can evaluate results while the test is in progress. The plotter is available in 24, 48 or 96 channel models. According to the manufacturer, these instruments reduce reruns—help eliminate faulty test setups and overloaded test specimens. For information write GILMORE INDUSTRIES, INC., Department 2001, 5713 Euclid Ave., Cleveland 3, Ohio or use reader card.

Circle 102 on Reader Service Card.

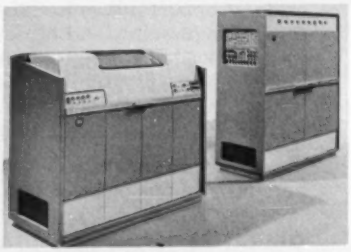
programmer

Operation of six– and eight–channel oscillographic recording systems for analog computer readout can now be automatically programmed, with a device developed expressly for this purpose. The joint operation of the 156– or 158-5490 console system in the model 183 programmer, occurs automatically in the following sequence (unless manually terminated): Step 1: recorder turned on; Steps 2 to 16: calibration signal voltages of 0, 100, 20, 10, 5, 1, .2, 0, – .2, – 1, – 5, – 10, – 20, – 100 and 0 fed to all channels; Steps 17 and 18: DC levels of computer read; Step 19: computer output recording for predetermined chart length, or as controlled by computer; Step 20: recorder turned off, Programmer reset for another cycle. For information write SANBORN COMPANY, Industrial Division, 175 Wyman Street, Waltham 54, Mass. or use reader service card.

Circle 103 on Reader Service Card.

line printer

A solid-state line printer which will select, edit and print out data from a computer or magnetic tape at rates up

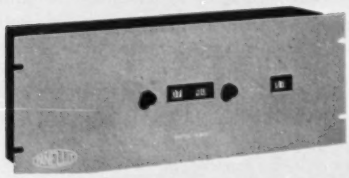


to 1500 lines per minute is available. This high-speed printer is integrated with the manufacturer's new 220 electronic data processing system. It features on-line or off-line operation, buffer data storage and automatic editing—all under plugboard control. Used on-line, the printer system takes advantage of the computer's electronic speed to produce up-to-the-second reports directly from the data processor. Off-line, it edits and transcribes data from the 220 magnetic tape storage units, freeing the computer for other processing jobs. For information write BURROUGHS CORP., ElectroData Division, 460 Sierra Madre Villa, Pasadena, Calif., or use reader service card.

Circle 104 on Reader Service Card.

digital clock

A universal digital clock, model 281, in which both visual indication and all three independent decimal outputs



are resolved in one second, is now available. Three isolated electrical circuits provide simultaneous readout presented serially for tape punch, typewriter and ten-key adding machine, or presented in parallel for card punch, high speed printers and computer entry. Any of the three outputs may be used for 12 or 24 hour indication and readout. The possibility of ambiguous readout during time changes is prevented by an automatic cut off. For information write PANNELIT, INC., 7401 N. Hamelin Ave., Skokie, Illinois.

Circle 105 on Reader Service Card.

digital voltmeter

Model 405AR provides fully automatic reading and reads positive and negative voltages from 100 millivolts to 999

volts with an automatic selection of range and polarity. Voltages are displayed in three significant figures and the decimal point is automatically placed. An accuracy of ± 0.2 percent of the reading ± 1 count is claimed for the unit. Special features of the instrument include a floating input, electronic analog-to-digital conversion, digital recorder output and a hold control which permits manual positioning of the decimal. For information write HEWLETT-PACKARD CO., 275 Page Mill Rd., Palo Alto, California.

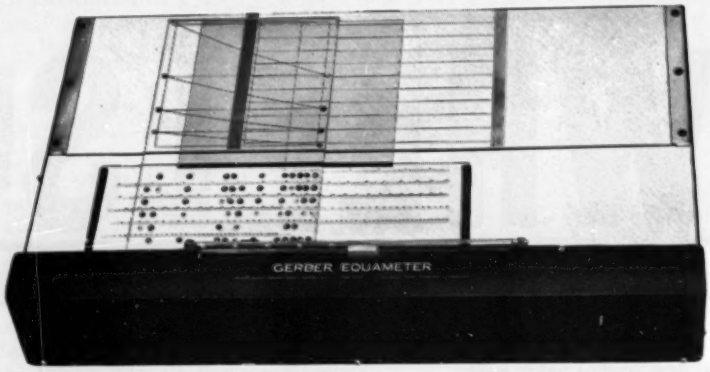
Circle 106 on Reader Service Card.

decimal counter

This counter employs a logical scheme which allows indication of true, positive and negative numbers, with a single zero, and eliminates the problem of double zeros as would be experienced if complementary techniques were employed for negative number indication, says the manufacturer. The range of the counter is ±99999 counts and it will also be available shortly

● ● ● DO YOU HAVE THIS BASIC GERBER TOOL FOR DATA REDUCTION?

GERBER EQUAMETER
Model GEQ-450
$550 F.O.B. Hartford
ORDER NOW!
2 Week Delivery

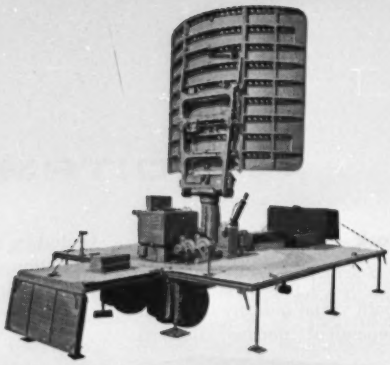


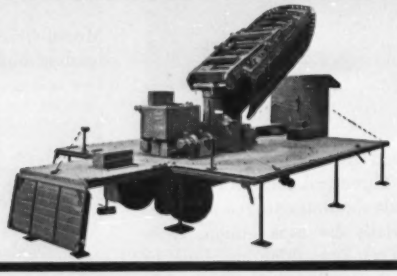
The GERBER EQUAMETER is a manually operated mechanical device for the analysis of recorded curves and the reduction of data in terms of Fourier series, Power series, Orthogonal polynomials, and other forms of equations and series. It will also produce a slope equation or an integral equation of the curve. The equations are obtained directly from readings on the machine which are recorded on a specially designed program sheet for each type of analysis. The machine will obtain coefficients for the series mentioned in a relatively short time. The results are highly reproducible and can be obtained quickly by a person not possessing extensive mathematical training.

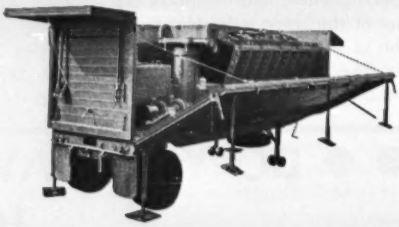
G S I **GERBER SCIENTIFIC INSTRUMENT CO., 89 SPRUCE ST., HARTFORD, CONNECTICUT**

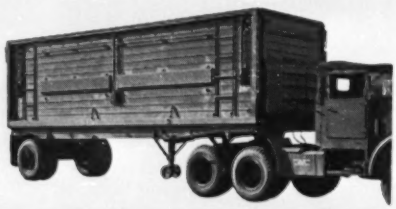
Circle 10 on Reader Service Card.

3-D RADAR ON WHEELS









How to conceive a radically improved radar scanning technique. How to integrate this technique into a superior data handling system. How to make the complete scanning and data handling system mobile.

These were the problems faced by engineers at the Hughes Ground Systems Division in Fullerton, California. Utilizing a completely new engineering concept, these engineers developed a radar scanning system which positions beams in space by electronic rather than mechanical means...thereby providing three-dimensional radar protection.

They developed high-speed data processors which monitor the action of hundreds of aircraft and store the shifting tactical situations for high-speed assignment of defense weapons. They produced compact electronic display systems which present the tactical information in symbolic and language form.

And then they made this complete radar and data handling system mobile. The radar scanning antennas (shown above) can be converted for travel on the road in minutes. The complete data processing and radar scanning systems, with all of their wide capabilities, have been engineered to occupy only a few standard size army van trucks.

The research, development and production of this advanced system is typical of the creative engineering now underway at Hughes in Fullerton. If creative engineering is your forte, you will find abundant aesthetic and monetary reward at Hughes. To investigate write to Mr. L. T. Wike at the address below.

HUGHES

GROUND SYSTEMS
Personnel Selection and Placement
Hughes Aircraft Company
Fullerton, Orange County, California

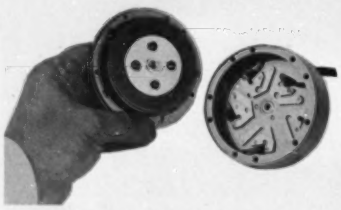
Circle 52 on Reader Service Card.

with the range extended to six decades. The counter operates at rates up to 50 KC. Each decade of the counter may be set to a predetermined value independent of the other decades and the entire counter may be reset to zero by operation of a single contact. For information write BENSON-LEHNER CORP., 11930 Olympic Blvd., Los Angeles 64, Calif.

Circle 107 on Reader Service Card.

digital encoder

A shaft-position digital encoder employing a magnetic readout principle has been developed. The input to

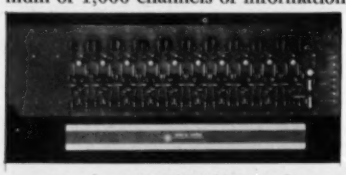


the EPD-3 can be any shaft position, such as a self-balancing potentiometer, valve position, indicator, etc. The binary code output of the encoder can be fed directly to amplifier and control circuitry. No mechanical or optical contact is used and only passive circuitry is involved. For information write APPLIED SCIENCE CORP. OF PRINCETON, P. O. Box 44, Princeton, N.J., or use reader service card.

Circle 108 on Reader Service Card

commutator

A new solid-state high-speed commutator will communicate up to a maximum of 1,000 channels of information



at rates of up to 100,000 samples per second, and can be used with any device requiring this type of commutation. It may be used to commutate either AC or DC signals to a voltage-to-digital converter, or may be used to commutate the output of a digital-to-voltage converter into a number of channels. If a holding circuit is required for the voltage outputs, solid-state sample and hold circuits are available. For information write PACKARD-BELL ELECTRONICS CORP., Technical Products Division, 12333 W. Olympic Blvd. Los Angeles 64, Calif. or use reader service card.

Circle 109 on Reader Service Card.

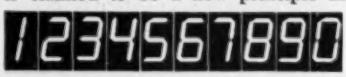
elevated flooring

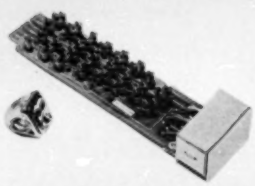
A new type of elevated aluminum flooring for electronic data processing facilities provides modular panels raised on pedestals to permit electronic tables to run in any direction underneath. The space below the raised panel floor can be used as a supply or return air plenum for heating and air-conditioning. This space can also accommodate other utilities. The floor panels themselves interlock with the sub-structure. For information write LISKEY ALUMINUM, INC., 1405A Rome Road, Baltimore 27, Maryland.

Circle 110 on Reader Service Card.

digital readout

A new in-line in-plane digital readout using selective group switching, which is claimed to be a new principle in



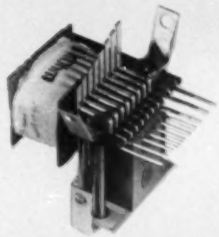


readout construction, is now on the market. The displayed characters are well-defined and easy to read, according to the manufacturer, even with high ambient light and at viewing angles up to 150°. The unit consists solely of a resistor matrix and neon bulbs utilizing a printed circuit plug-in connector. Model SGS-101 is illustrated. For information write ELECTRONIC EQUIPMENT DIV., I.D.E.A. Inc., 7900 Pendleton Pike, Indianapolis 26, Indiana., or use card.

Circle 111 on Reader Service Card.

eight reed relay

Models A and N eight reed relays provide eight individual controls responding to audio tones using a single drive

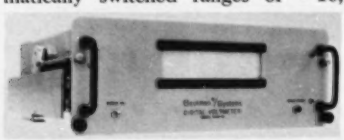


coil. The reeds are made from precision steel, copper-plated and hard silver coated. Frequency band is 280 to 500 cps. Inter reed spacing is approximately 15 cps and the reed bank is thermally stable. Other features — maximum switch power of one half watt, operating power of 0.5 mW, weight is 1.7 ounces, and size is $1\frac{7}{16}$ by $1\frac{3}{8}$ by $1\frac{3}{4}$ in. The unit is used for programming and selective telemetering over two wires or radio control. For information write REMOTE CONTROL MANUFACTURING COMPANY, 268 Marlborough Drive, Pontiac, Mich., or use reader service card.

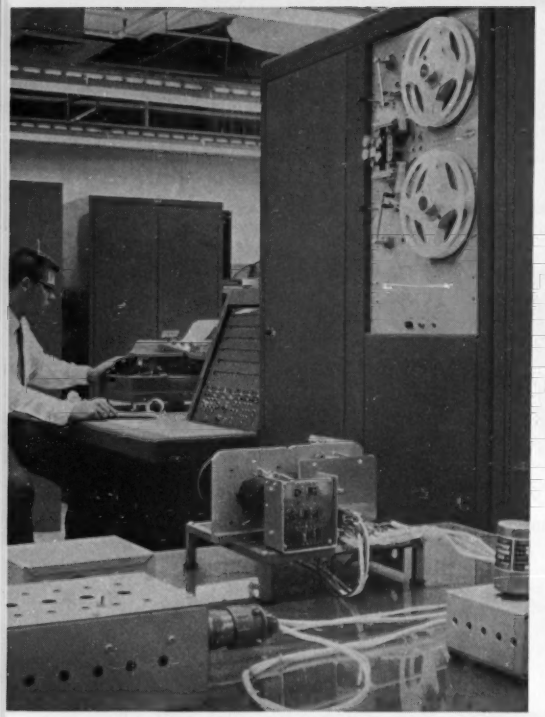
Circle 112 on Reader Service Card.

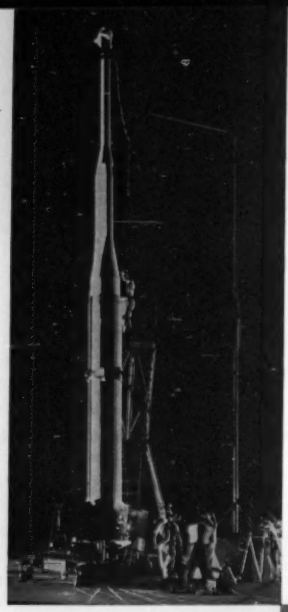
digital voltmeter

Accuracy and resolution of Model 81 is 0.015 percent over the three automatically switched ranges of ±10,



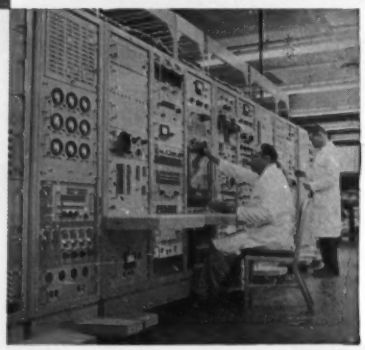
±100 and ±1,000 volts DC. Input impedence of the instrument is 10





(left) Lockheed X-17. Lockheed-designed checkout computers are already proving their effectiveness in service.

(below) Another Lockheed-designed automatic missile check-out for quick determination of flight readiness.



(left) Automatic Checkout and Readiness Equipment (ACRE)—a Lockheed product—automatically performs pre-program missile checkouts and runs diagnostic routines to localize trouble.

EXPANDING THE FRONTIERS OF SPACE TECHNOLOGY

...Computer Development

Lockheed's capability in the design and development of computers is contributing to the advancement of the state of the art. Research is being conducted in the building of machines capable of reading 5,000 characters a minute; in the development of high-speed digital plotters which will operate up to 5,000 points a second from magnetic tape input; in the improvement of library reference systems for the storing and retrieval of information; and in the study of self-organizing machines using variable threshold neurons that will operate essentially without programming.

The ACRE system developed by Lockheed combines outstanding performance at the lowest cost in the industry, and has broad applications to a number of other missile and space projects.

Scientists and engineers of outstanding talent and inquiring mind are invited to join us in the nation's most interesting and challenging basic research and development programs. Write: Research and Development Staff, Dept. B-46, 962 W. El Camino Real, Sunnyvale, California.

"The organization that contributed most in the past year to the advancement of the art of missiles and astronautics."
NATIONAL MISSILE INDUSTRY CONFERENCE AWARD

Lockheed / MISSILES AND SPACE DIVISION / SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA CAPE CANAVERAL, FLORIDA ALAMOGORDO, NEW MEXICO

Circle 53 on Reader Service Card.

megohms at all times even when digitizing and under conditions of overload. Operationally, the voltmeter looks at the unknown input, balances it with a signal from a precision digital-to-analog converter and presents the reading in the converter. These operations are repeated 15 times per second. Output presentation is by both a dot projected visually readout and a 10 line decimal code. The visual readout shows four digits, the polarity sign and correct location of the decimal point. For information write BECKMAN, Systems Division, 325 N. Muller Ave., Anaheim, Calif.

Circle 113 on Reader Service Card.

d-c microvoltmeter

An all-transistor d-c microvoltmeter with over 100 megohms input impedence on all ranges from ± 0.001

volts to ± 1,000 volts, the model 1362 features 12 hours continuous operation from an integral storage battery. Recharge is automatic when the instrument is plugged into the power line. It is chopper-stabilized to avoid drift problems, and provides total isolation from the power line. For information write DYNAMICS INSTRUMENTATION CO., 1118 Mission St., S. Pasadena, Calif., or use reader service card.

Circle 114 on Reader Service Card.

transistor logic circuits

These units are designed to work at speeds in excess of 2 megacycles under typical loading conditions. The module is designed to fit a standard 7 pin-inline subminiature tube socket. Up to 144 units may be mounted on a standard 3½ in. by 19 in. rack panel. Each module measures .750 in. high, .687 in. wide and .297 in. thick. The standard unit contains 4 inputs. For information write ERIE RESISTOR CORP., Erie, Penna., or use card.

Circle 115 on Reader Service Card.

binary-decimal encoders

A new line of 8-4-2-1 binary-coded decimal shaft encoders covering a range of 2 to 6 decades is available. Five models provide 100 counts per turn, employ a standard size 23 BuOrd synchro mount, and use self-selecting brush V-scan logic, which eliminates external anti-ambiguity electronics. A special self-checking error feature automatically indicates errors if they occur, thus making possible exceptional reliability, according to the manufacturer. For information write NORDEN, Division of United Aircraft Corp., Milford, Conn. or use card.

Circle 116 on Reader Service Card.

data reader

Used to reduce photographic data to digital form for electrical transcription, this reader can measure photographic

transparencies on plates, sheet film, or roll film. X and Y ordinates are measured to a least count of 0.001 in., and angles to 0.1 degree. Analog-to-digital transducers present the measurements for visual display and also for electrical transcriptions by standard transcribing and recording equipment. Numerical data may be inserted into the transcription system through punched keyboards and rotary switched panels. Quick-change keyboard programming plugs and an accessory plugboard programmer assist in organizing the data output. For information write FAIRCHILD DATA DEVICES CORP., 580 Midland Ave., Yonkers, New York.

Circle 117 on Reader Service Card.

oscillogram scanner

Model S-10 was designed to solve data reduction problems where an operator is required to scan a record over a large

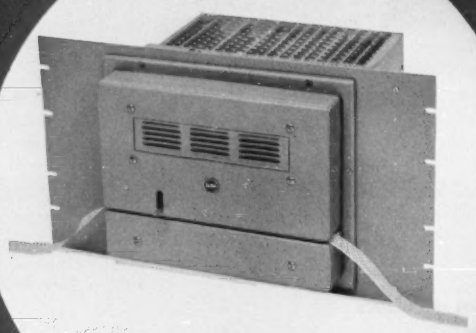
area. Oscillogram strips up to 1000 feet in length may be tracked across the 66 in. illuminated scanning surface. Controls are provided in a panel set flush at desk level. The operator may adjust record speed to a maximum of 100 feet per minute; select light intensity; or control record tension, direction and breaking. For information write GERBER SCIENTIFIC INSTRUMENT CO., 89 Spruce Street, Hartford 1, Conn., or use reader card.

Circle 118 on Reader Service Card.

automatic chart reader

Strip or circular chart, film, or photographic traces are scanned optically by the basic reader. This reader produces a pulse-width modulated signal proportional to the ordinate of the trace as the chart drive moves the chart past the scanner. Optional accessory units convert this signal to digital, analog or mechanical outputs. Output may be

another Potter First



THE
NEW POTTER "909"

Now... a device that READS and STOPS faster, better

The compact '909' Perforated Tape Strip Reader now makes it possible to process information from perforated tape into digital data computer systems at high speed and low cost. Simple to operate by clerical personnel, the '909' is completely transistorized, and will give maximum performance with complete reliability.

The '909' is a compact unit, suitable for console or rack mounting. Here are some of the performance features, available for the first time in equipment of this type:

- Character reading speeds up to 1000 char/sec.
- Simple In-Line threading
- 3 Millisec starting time
- Stops on STOP Character, (0.2 millisec) and will read next character after start
- 100 x 10^6 operation pinch roll
- Photo Diode Head reads any tape (including oiled yellow teletype tape)
- Reads 5, 6, 7 or 8 level tape with sprocket channel
- Ambient temperature up to 125° F. with 10,000 hour life
- Built to meet requirements of MIL-E-4158A

Specifications

Tape Speed:
10 to 100 ips

Tape Width:
Any Standard Width

Power Requirements:
115V, 60 Cycle, 1 Phase

Control:
Remote/Level Inputs

Contact your Potter representative or call or write direct for further information.

Potter
The mark of Engineering Quality

POTTER INSTRUMENT COMPANY, INC.
Sunnyside Boulevard, Plainview, N. Y.
OVerbrook 1-3200

Potter has career opportunities for qualified engineers who like a challenge, and the freedom to meet it.

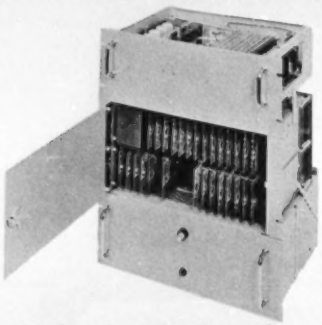
Circle 11 on Reader Service Card.

stored on punched cards, punched tape, magnetic tape, or displayed on automatic printers. Nominal scan rate is 7200 times per minute, accuracy is ±.1% full scale. For information write THE GEOTECHNICAL CORP., P. O. Box 28277, Dallas 28, Texas.

Circle 119 on Reader Service Card.

auxiliary memory

A new core storage buffer operates at a rate of 100,000 characters per second. It accepts a block of data up



to 720 characters of 6, 7 or 8 binary bits each. Inclusion of marker pulses to indicate when a block of data has been loaded is a feature of model 720-BA7. This permits loading of more than one block of data at a time. The buffer also provides parallel loading and unloading of all bits of each character, sequential loading and unloading of characters and remote manual or electronic clearing. Other features – optional input register, output register, align register, and parity check. For information write TELEMETER MAGNETICS INC., 2245 Pontius Ave., Los Angeles 64, California.

Circle 120 on Reader Service Card.

data reader

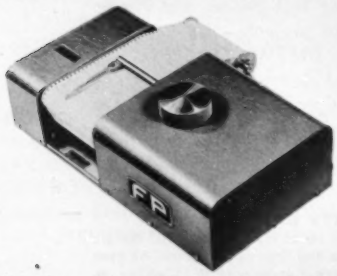
This instrument is designed to facilitate the reading and scanning of oscillograms. Two rollers mounted in the rear run the recorded data either forward or backward over an illuminated scanning plate. A tension control adjusts for different paperweights and widths to provide good tracking. Another con-

trol adjusts to maintain the proper tension when the record is stopped in order to be read. In addition, the speed at which the record runs can be varied from zero to 200 feet per minute. The electronic reading head for this instrument is a device that represents physical distances, such as amplitudes and frequencies on oscillograms as proportional voltages. For information write THE GERBER SCIENTIFIC CO., 89 Spruce Street, Hartford 1, Conn.

Circle 121 on Reader Service Card.

strip chart planimeter

A portable strip chart planimeter, model 52PA1010, has been designed especially for integrating records pro-



duced on 4 in. wide recorders. Either linear or square route totalization is available by changing a characterized cam. The chart is fed through the planimeter at a speed of from zero to 12 chart hours per minute. Speed is set by a pressure controlled rheostat. As the chart feeds through the planimeter, the pointer is positioned over the chart record line by means of a manually-operated know. The chart record is thus totalized in numbers on a 5-digit manual reset counter. At full scale, 100 counts are accumulated for each hour of chart record. For information write FISCHER AND PORTER CO., 808 Jacksonville Rd., Hatboro, Penna.

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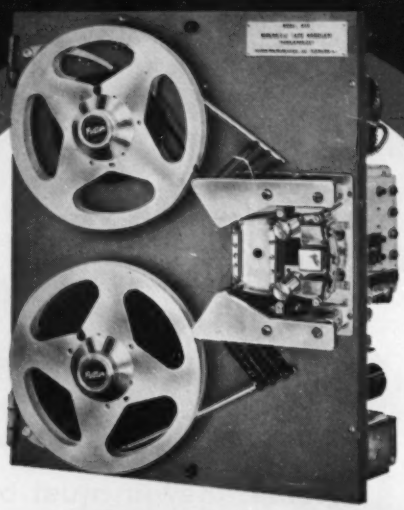
'space' system

Work on a Universal Automatic Tester capable of rapidly evaluating within assigned limits functional capabilities

New Speed...Versatility...Reliability...



TRANSISTORIZED DIGITAL MAGNETIC TAPE HANDLER
MODEL 906

• Check these new standards of reliability and performance

- Completely transistorized for maximum reliability
- Trouble free brushless motors
- Over 50,000 passes of tape without signal degradation
- Linear servo system
- Life expectancy of pinchroll mechanism: over 100,000,000 operations
- Skew ±3 μsec ½" tape, center clock at 100 i.p.s.
- Vacuum loop buffer
- Continuous flutter free cycling 0 to 200 cps
- Normal speed up to 100 i.p.s.
- Rewind or search speed constant at 300 i.p.s.
- Six speeds forward or reverse up to 150 i.p.s.
- Better than 3 milliseconds start, 1.5 millisec. stop
- Front panel accessibility
- In line threading
- End of tape and tape break sensing
- All functions remotely controllable
- Tape widths to 1¼"

The 906 is usually supplied with the Potter 921 transistorized Record-Playback Amplifier; a unit that features:

Pulse or level outputs
Output gating
1 i.p.s. to 150 i.p.s.
Manual, relay, or electronic function switching
Dual read-write operation

Potter also manufactures a complete line of Perforated Tape Readers, High Speed Printers and Record-Playback Heads.

Contact your Potter representative or call or write direct for further information.

Potter
The mark of Engineering Quality

POTTER INSTRUMENT COMPANY, INC.
Sunnyside Boulevard, Plainview, N. Y.
OVerbrook 1-3200

Potter has career opportunities for qualified engineers who like a challenge, and the freedom to meet it.

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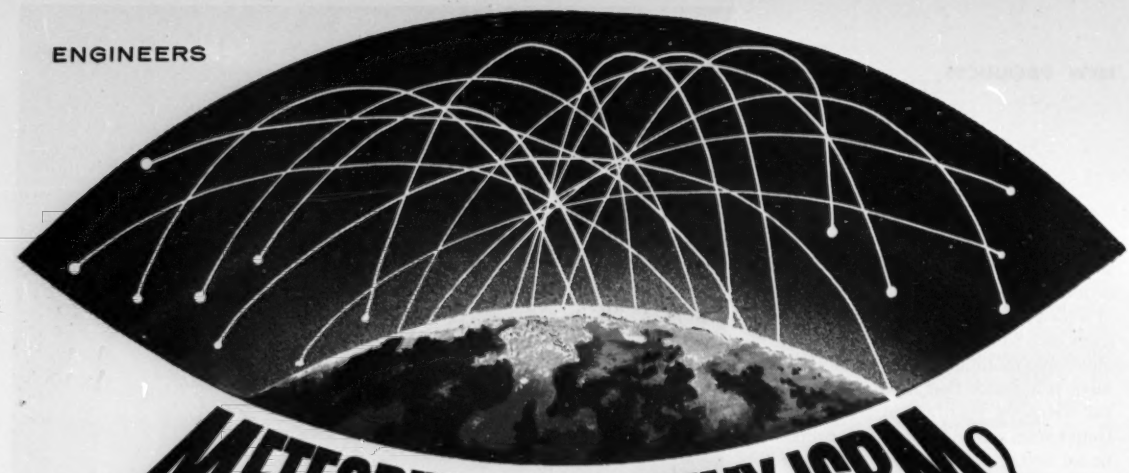
ENGINEERS



METEORITES...OR ENEMY ICBM?!

...the answer must be found...in seconds

Of the estimated billion meteorites that strike the upper atmosphere every day, the probability is slight that one will bulk large enough to attract the attention of the Ballistic Missile Early Warning System now being developed for the USAF.

Yet the possibility must be considered...and resolved. This means hitherto unattained criteria of accuracy, reliability and speed must be met in every phase of the DATA PROCESSING SYSTEM which Sylvania is creating for BMEWS.

Are you professionally ready to take up the challenge of solving problems of this order? There are opportunities now in Sylvania's new DATA SYSTEMS OPERATIONS that will utilize your full potential. Positions exist *at both Senior and Junior levels* on a variety of projects – the computer "heart" and "brain" of BMEWS, MOBIDIC, and other highly advanced electronic systems. These openings afford exceptional career growth – due to programmed expansion in the following areas:

SENIOR PROGRAMMERS

For the design and development of large scale programming efforts connected with Sylvania's MOBIDIC computer – as well as with BMEWS (Ballistic Missile Early Warning System). Requires familiarity with electronic systems and their engineering requirements, design of real-time computer operation systems and the organization of data processing programs. Necessary background includes extensive knowledge of stored programmed computers, proposed operation system of BMEWS type, and proven ability to supervise programmer.

RELIABILITY ENGINEERS

Will cover all phases of reliability for systems design, application of components and final performance. We seek competent men with practical experience in reliability engineering, particularly with respect to systems applications.

COMPONENT ANALYSIS/APPLICATIONS RELIABILITY ENGINEERING

Bachelor's or higher degree in scientific major and 3-5 years experience in components analysis or reliability engineering in electronics/electrical field. Some design and packaging experience desirable; appreciation for reliability approach is necessary.

If you are interested in the investigation of many new techniques relating to high speed memory and exceedingly advanced circuit work, send resume to Bruce Stryker.

DATA SYSTEMS OPERATIONS SYLVANIA ELECTRONIC SYSTEMS

A Division of

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.

189 B Street – Needham 94, Massachusetts

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of a weapon system, sub-system, or components without manual surveillance, has been completed. The SPACE (Systron Precision Automatic Checkout Equipment) system provides for automatic IBM card programming and will accept 1,000 inputs from any electronic sub-assembly. The unit provides complete printed record, precision limit detection, in-line readout and removable patchboard for control logic and switching of stimuli to the unit under test. For information write SYSTRON CORP., 950 Galindo St., Concord, Calif., or use reader card.

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digital-channelizing system

A multi-channel digital data transmission system designed to facilitate point-to-point communication of multi-channel binary signals by radio, wire or teletape has been developed. The Phase Multilock System is said by the manufacturer to represent a considerable advance over the conventional frequency-shift keying method, since it is dependent for signal sequencing on phase position, rather than frequency channelizing, resulting in a substantial reduction in noise interference and band-widths necessary for communication. Listed applications include telemetering, computer data transmission, and any situation requiring multiple transmission of binary signals. For information write AERONAUTICAL AND INSTRUMENT DIVISION, Robertshaw-Fulton Controls Co., 401 N. Manchester Blvd., Anaheim, Calif.

Circle 124 on Reader Service Card.

"Tools designed by the Bendix G-15 computer give our customers maximum value"

says EDWIN J. MERRICK, *Director of Engineering*, NATIONAL TOOL COMPANY, CLEVELAND

"The growth of automation has placed previously unheard of demands on the tool industry for products of high precision and optimum life. National Tool has installed a Bendix G-15 computer, which now enables us to arrive at these characteristics in our gear generating tools by scientific methods. We consider the G-15 vital in maintaining our position as the world's largest manufacturer of a complete line of special gear generating tools."

THE G-15 FEATURES compactness and proven reliability at low cost. Memory and speed of computers costing four times as much. Simplified operating methods — easy to learn, easy to use. Typewriter and paper tape input-output at no extra cost. Paper tape input to 250 char./sec. Expandability through accessories for 1,200,000 words of magnetic tape storage and punched card input-output. Extensive program library. Users share programs. Nationwide service organization. Lease or purchase.

Bendix Computer DIVISION OF BENDIX AVIATION CORPORATION

Built and backed by Bendix, the G-15 is serving scores of progressive businesses large and small throughout the world. For details write to Bendix Computer, Department E-8 Los Angeles 45, California.

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storage systems

A line of small coincident-current magnetic core storage systems of modular construction is available, designed for use in small computers and special-purpose data-handling equipment. The modular construction allows quick assembly of a memory to the user's exact requirements of number of words, word length, type of access, etc. The photograph shows a typical memory of this type. It has 5,200 bits of storage with random access and serial input and output. No vacuum tubes are used. The magnetic cores are sealed against mechanical accidents. Memories can be assembled up to 512 words, up to 60 bits word length, down to six microseconds access time, and any combination of serial and parallel input and output. For information write DI-AN CONTROLS, INC., 40 Leon Street, Boston, Mass. or use reader service card.

Circle 125 on Reader Service Card.

ac/dc digital voltmeter

Model 402 digital voltmeter provides 100-microvolt resolution in dc, 1-millivolt in ac. The instrument consists of

three units which can be rack-mounted separately or together: (1) model 425 ac converter is an all-electronic device that translates ac input voltages into equivalent dc signals. (2) Model 451 control unit compares the dc signal from the ac converter with a chopper-stabilized reference supply voltage. (3) Model 471 readout unit may be mounted at any point remote from the other two units. It is connected to the control unit by a single readout cable. For information write KINTEL, a Division of Cohu Electronics, Inc., 5725 Kearny Villa Rd., San Deigo 12, Calif.

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tape cartridge

Continuous tape cartridge, model 203, is designed to accept up to 100 feet of paper or plastic punched tape for computer, automatic-dash test equipment, and similar applications. This cartridge does not require driving belts or any other type of external mechanism, other than the tape punch or reader itself. It obviates the need for baskets and other cumbersome containers according to the manufacturer, and permits the handling of punched tape loops. For information write BROOKS RESEARCH INC., Rochester 10, N.Y.

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In the Research Center of the World

CREATING ATTRACTIVE OPENINGS

CEIR offers a unique professional atmosphere. Challenging problems of far-reaching significance encourage initiative and assembly, analysis and presentation of data. Experience with EAM of modern analytical techniques for the solution of today's defense, government, business and financial problems.

STATISTICIANS

Advanced degree level; dedicated to the orderly and systematic assembly, analysis and presentation of data. Experience with EAM and electronic computing equipment; familiarity with government and business statistical series. Salary range: $11,000 to $13,000, according to qualifications.

APPLIED MATHEMATICIANS

Advanced degree level, or equivalent in training and experience. Applicants should be skilled in numerical analysis or have some background in Operations Research. Familiarity with stochastic models particularly desirable. Salary range: $9,000 to $13,000, according to qualifications.

COMPUTER PROGRAMMERS

Experienced—to work on IBM 704 and 709—trajectories, information retrieval, linear programming or applied mathematics preferred. A strong background in mathematics and/or knowledge of EAM equipment useful.

To explore CEIR's outstanding career opportunities, which include attractive profit-sharing and retirement plans, send resume to:

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SENIOR MATHEMATICIANS:

Raytheon Missile Program will open extensive facilities for Mathematical Analysis

Because the advancement of missile technology depends largely on the vital contribution of mathematical analysts, Raytheon will house an IBM-704 computer and accessory equipment in a new building which it is now completing.

Experienced mathematicians who join our expanding mathematics group will tackle some of the most interesting problems in missile development. Requirements are a proven record of accomplishment in applied mathematical analysis and digital computer programming. Openings exist in supervisory as well as senior non-supervisory positions.

Raytheon—already the only electronics company with two prime missile contracts, Army Hawk and Navy Sparrow III—anticipates even greater expansion in the coming years. Why not learn more about how you can get in on the ground floor of this newest facility which will contribute so much to the advancement of missile technology.

CALL COLLECT, PLEASE for interview or further information. Ask for Mr. J. Clive Enos at Bedford, Massachusetts. The number is CRestview 4-7100. If you prefer, write to Mr. Enos at Raytheon Manufacturing Company, Missile Systems Division, Bedford, Massachusetts.

RAYTHEON MISSILE SYSTEMS DIVISION

Excellence in Electronics

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Senior
Computer Programmers

Those interested in performing advanced research and development on programming techniques will find full scope for their ability at System Development Corporation in Santa Monica, California. SDC's projects are concerned primarily with developing large-scale, computer-based systems in a number of fields. The application of advanced digital computer techniques is particularly important in developing these systems.

A few positions are open for senior Computer Programmers. The positions call for strong experience and ability in programming and keen interest in:

Mechanical and programmed techniques—

Data retrieval techniques—

Logical design of computers from a Programmer's point of view—

Pattern recognition and machine learning—

Language translations (both natural and computer-oriented languages).

Those who desire additional information are invited to write William Keefer at System Development Corporation, 2478 Colorado Avenue, Santa Monica, California.

SYSTEM DEVELOPMENT CORPORATION

Santa Monica, California

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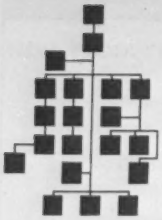


people moving up in DATAMATION

Roger L. Sisson was recently appointed manager of the systems department in the Tactical Operations Central Project, computer division, Aeronutronic Systems, Inc., a subsidiary of Ford Motor Co. Sisson, formerly a partner in the data processing consulting firm of Canning, Sisson and Associates, was co-author (with Myron B. Solo) of an article appearing in the last issue of DATAMATION entitled "Selecting Electronic Data Processing Equipment." Sisson's name was inadvertently omitted from the byline. Our apologies. **Dr. Joseph V. Charyk** has been granted a one-year leave of absence from Aeronutronic. Dr. Charyk, general manager of the Aeronutronic's Space Technology Division, was named Chief Scientist of the United States Air Force .... **James K. Chapman** has been named engineering manager for the multi-million dollar advanced electronics control system being designed, developed and managed for the AF by General Electric's Heavy Military Electronics Dept. in Syracuse, N. Y.

New vice president and general manager of United Electro-Dynamics, Pasadena, Calif., is **William P. Patterson.** His duties include direction of engineering, manufacturing and sales of United's products in the fields of transistorized telemetry, data redution and custom instrumentation ....

W. P. Patterson
Vice President, United ElectroDynamics

R. L. Sisson
Aeronutronic Systems, Ford Motor Co.

Dr. A. G. Anderson
International Business Machines Corp.

G. S. Younkin
Minneapolis-Honeywell Regulator Co.

Dr. E. M. Grabbe
Thompson-Ramo-Wooldridge Products Co.

D. R. Proctor
Electronic Engineering Co. Of California

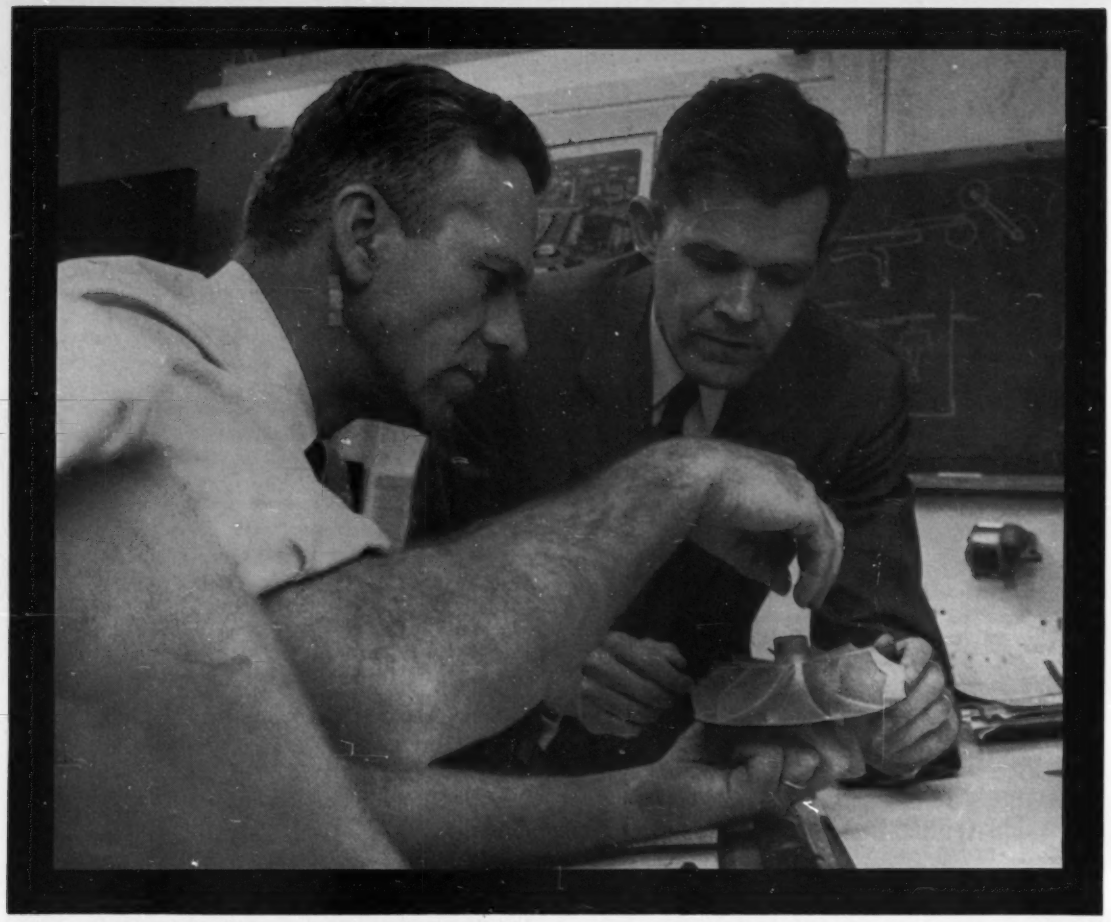
Samuel Ochlis has been appointed division manager of the Instrument and Equipment Div., Epsco, Inc., Boston. The division designs and manufactures building blocks in large data handling systems .... At Space Technology Laboratories, Inc., Los Angeles, **Dr. Edward K. Blum** was appointed director of the computation and data reduction center January 6. At the same time, **Donald W. Gantner** was named the center's associate director. **Jules Mersel** had previously been installed as manager of the center's data processing and operations department.

Appointment of **Dr. Arthur G. Anderson** as acting manager of Basic Science was announced at IBM's Research Laboratory in San Jose, Calif. Other IBM advances – In White Plains, N. Y., **Chester R. DeCarlo** has been appointed manager of marketing and service in the Data Processing Div. **Clark Garrison, Jr.,** has been made sales manager; **Robert H. Howe** is dp director of sales; and **Charles C. Smith,** now director of marketing programs. In Los Angeles, **Norman N. Glynn** has been named manager of the L.A. West sales office .... **J. Todd Murphy** of New Canaan, Conn. has joined Telemeter Magnetics, Inc., Los Angeles, as applications engineer in New York and New England.

Dr. Eugene M. Grabbe, senior staff consultant on automation, Thompson-Ramo-Wooldridge Products Co., will head the U. S. Exhibits Committee for the International Conference on Information Processing to be held in Paris, France, next June 13-22. Also at T-R-W, **Dr. R. Curtis Johnson,** computer specialist, has joined the company's technical staff .... **Jack H. Zillman** is now general manager of Daystrom Pacific, Los Angeles .... Further expansion of the computer engineering staff of Control Data Corp., Minneapolis, has been announced. Key men in the expansion are senior computer engineers **Kenneth E. Johnson, Charles T. Casale** and **James D. Johnson.**

Gavin S. Younkin, vice president and general sales manager of Minneapolis-Honeywell Regulator Co., has taken over active direction of the sales activities of the company's Datamatic Division in Boston .... The following appointments were announced by Consolidated Electrodynamics Corp., Pasadena: **Albert W. Brandmaier** is now director of CEC European operations; **Philias H. Girouard** fills the newly-created position of development coordinator; **Henry S. Black** is head of the DataTape Div.; and **Paul N. Bertness** is now CEC's advertising manager.

At Electronic Engineering Co. of California in Santa Ana, **Don R. Proctor** was named chief engineer replacing **L. S. Preston** who is now with Space Technology Laboratories .... Two Burroughs Corp., ElectroData Div. advances have been made. In Dallas, **Donald L. Benscoter,** and **William H. Stewart** in Philadelphia have been made district managers.



child of Thought

"Experience," said Thomas Carlyle, "is the child of Thought." This is eminently true at Technical Operations, Incorporated, where the new uses of operations research have been pioneered and developed. All the successful experience of tech/ops, from power converters for missiles to war games for military planning . . . from beta ray sources to detection of underwater nuclear explosions . . . has grown from new applications of reasoning, both in teams and in solitary thought, in conference and alone.

Tech/ops will be happy to tell you more about this new integrated approach, which is producing new decision-making capabilities for business and industry, new weapons systems, tactics, organization and logistics for military applications.

Address: ROBERT L. KOLLER

TECHNICAL OPERATIONS, INCORPORATED
Burlington, Massachusetts

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for your career at:

FORT MONROE, Virginia; WASHINGTON, D. C.; or BURLINGTON, Massachusetts: operations analysts experienced in weapons systems evaluation, computer techniques, transportation problems, or related fields . . . physical scientists in mathematics, M.S. or Ph.D., who desire to participate in formulation and solution of operational problems.

WASHINGTON, D. C.: mathematical statistician (Ph.D. with five years' experience) for research in sensitivity of stochastic games.

MONTEREY, California: Applied mathematician with understanding of application of high speed computers to operational analysis . . . senior scientist on Ph.D. level in operations research, mathematics, or physics.
(please indicate location preference)

tech/ops

new DATAMATION literature

EDP SYSTEM: Information on the new transistorized RCA 501 electronic data processing system is contained in a literature kit. Several features of the new system include variable length recording of data, providing—storage, without special programming and in less space on magnetic tape; short tape-start time and short gap between entries, giving a saving in processing time; simultaneous operations without extra circuitry. The kit contains several folders, leaflets and a twelve-page, four-color, fully illustrated booklet. For copy write RADIO CORPORATION OF AMERICA, EDP Division, Camden, New Jersey, or use card.

Circle 200 on Reader Service Card.

PATCHCORD SYSTEMS: A four-color, twenty-page, brochure gives a profile of this company's patchcord programming systems and panels. According to the manufacturer these systems and panels are, basically, general purpose manually operated switches which permit, through proper patchcord and/or patchboard selection, nearly infinite switching combinations. Fully illustrated with diagrams and photographs, this brochure gives comprehensive details on many systems. For copy write AMP Inc., Harrisburg, Pennsylvania, or use reader card.

Circle 201 on Reader Service Card.

Is Electronic Data Processing just INSTANT RED TAPE?

Are you wondering whether the use of EDP in your organization will mean copying old faults into a high-speed system—because newer methods are untested and risky?

Well, many of the newer methods aren't untested and risky. By now, they have been PROVED OUT.

You can learn what important problems have been faced and SOLVED by others . . . by depending on the *concise, fast-reading* digest of EDP information — DATA PROCESSING DIGEST.

This unique monthly service brings you digests of every key article on EDP appearing in more than 110 periodicals, as well as every significant book, report and paper in the field. When something *important* has been accomplished, DATA PROCESSING DIGEST tells you about it, quickly and accurately.

Whatever the status of your EDP program, you know that your decisions can be some of the most money-saving — or money-wasting — you'll ever face.

Let DATA PROCESSING DIGEST — now in its fourth year of service — find the profit-pointing and tested-method articles that will help you.

See for yourself how valuable this monthly service — which contains no advertising and gives you unbiased reporting—can be to your EDP program. Accept our offer of a *Trial Subscription* for 3 months for $7 (regularly $24 per year). Just send this ad with your check for $7, or tell us to bill you. (Or send for our free descriptive brochure.) Address: Data Processing Digest, 1140X S. Robertson Blvd., Los Angeles 35, Calif.

Circle 14 on Reader Service Card.

HIGH SPEED PRINTERS: Ten-page, illustrated leaflets are now available on this company's high speed printers: Series 56-72, comprises a printer, a bank of thyratron drive circuits, and associated power supplies—produces printed copy on single, multiple carbon, or transfer type forms. Series 56-24 and 66-24, is a system complete and ready to receive information from a decoder, electronic counter, or whatever other form of converter is provided. Series 56-160, comprises a printer, paper feed electronic controls, a bank of print hammer drive circuits and power supplies. For copies write ANELEX CORPORATION, 150 Causeway St., Boston, Massachusetts.

Circle 202 on Reader Service Card.

SAGE DATA SYSTEM: Reprints are available of a five-page article entitled "A High-Speed Data Signaling System," which first appeared in the Bell Laboratories Record. The A-1 Digital Data Signaling System, designed by this company to transmit up to 1,600 bits per second is usually called the Sage data system for its first application was in the Air Force SAGE project. Illustrated with photographs and diagrams, the article, by E. A. Irland, contains comprehensive detail on this high-speed data transmission system. For copy write BELL TELEPHONE LABORATORIES, INC., Publication Department, 463 West St., New York 14, New York.

Circle 203 on Reader Service Card.

FERRITE CORES: Labelled a condensed catalog, this four page illustrated leaflet presents the basic characteristics of this manufacturer's standard product lines. Dealt with are, ferrite cores, computer memories, core storage buffers, core arrays, data translators. Designed to provide preliminary information on these items, detailed specifications may be obtained later upon request. For Copy write TELEMETER MAGNETICS, INC., 2245 Pontius Avenue, Los Angeles 64, Calif., or use reader service card.

Circle 204 on Reader Service Card.

TAPE READER: Fully described in a six-page, illustrated folder is this company's Model 424 bi-directional punched tape reader. Asynchronous operation, zero to sixty characters per second, this tape reader may be slaved to any other device operating at speeds up to 60 character readings per second. For copy write TALLY REGISTER CORPORATION, 5300 14th Ave., N.W., Seattle 7, Washington, or use reader service card.

Circle 205 on Reader Service Card.

DIGITAL TAPE: Designed specifically for digital recording, this company's Type A digital recording tape is described in a ten-page bulletin RS58-1. Physical characteristics, magnetic properties and cost to consumer are detailed in the bulletin. For copy write REEVES SOUNDCRAFT CORP., 10 E. 52nd St., New York 22, New York, or use reader service card.

Circle 206 on Reader Service Card.

ENGINEERS

Unusual growth opportunities now open with new Research Center of Ford Motor Company Subsidiary at Newport Beach in Southern California.

Attending the Western Joint Computer Conference in San Francisco March 2 to 6, 1959:

VISIT
AERONUTRONIC
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Aeronutronic—a dynamic new name in science and research—is moving into the future and moving fast. The Computer Division of Aeronutronic Systems, Inc., has a number of career opportunities available for engineers capable of contributing to data processing technology and related fields. Positions are at our new Research Center at Newport Beach overlooking the harbor and the Pacific Ocean. You'll work in an intellectual environment as stimulating as the physical location is ideal—in a community away from congestion, yet close to most of Southern California's cultural and educational centers. The following are some typical positions now available:

SYSTEM DESIGN ENGINEERS EE, Physics, or equivalent. 5-10 years experience, 2 years supervisory. Creative in overall system concepts. Familiar with computer or data processor systems, circuit capabilities and practices, and logical design.

DIGITAL CIRCUIT DESIGN ENGINEERS EE or equivalent. Experience in transistor switching and drum circuitry. Capable of doing creative circuit development. Knowledge of input-output circuit design problems and techniques. Minimum one year experience in transistor digital circuit design.

MECHANICAL ENGINEERS ME, or equivalent. 5-10 years experience, development of precision electro-mechanical devices. Familiar with optical and photographic instrumentation and automatic controls. Capability for making theoretical analyses desirable.

COMMUNICATIONS ENGINEERS For communications systems planning in both telephone and radio systems, with experience in military systems, preferably U.S. Army.

SENIOR DIGITAL COMPUTER PROGRAMMERS EE, Physics, Math, or equivalent. 4-7 years experience, including 2 years supervisory. Familiar with analysis and programming of computational programs, data processing programs, clerical procedures, automatic programming.

MAGNETIC MEMORY ENGINEERS Advanced degree in Physics or EE important. Experience in multi-aperture memory techniques very desirable. Magnetic Core memory experience required. For work in research and development of high speed magnetic memory system.

LOGICAL DESIGNERS EE, Physics, Math, or equivalent. 2-10 years experience in computer design. Familiar with all aspects of computer design (including input and output). Capable of including circuit specifications and limitations.

DISPLAY ENGINEERS EE, or equivalent. 3 years experience. Familiar with conventional and special CRTs and storage tubes.

OPTICAL ENGINEERS ME, Physics or equivalent. 3 years experience. Familiar with development and theoretical analysis of optical systems.

ELECTRONICS PACKAGING ENGINEERS BS in ME or EE. 3 years minimum experience preferred in computer transistorized printed circuits. To supervise packaging and fabrication of computer equipment.

ENGINEER IN DIGITAL TECHNIQUES Degree in Physics or EE required. Experience in magnetic computer logic and memory components important. Semiconductor application experience required. Will work in research and development of multi-megacycle magnetic computer elements.

To arrange a confidential interview with senior staff members in San Francisco, qualified applicants for these and other related positions in computer design and engineering are invited to visit Aeronutronic's Booth No. 39 at the Western Joint Computer Conference in the Fairmont Hotel. Or, if you prefer, direct a resume to Mr. R. W. Hauk, Aeronutronic Systems, Inc., Box NH-486, Newport Beach, California. (Telephone KImberly 5-9421).

COMPUTER DIVISION | **AERONUTRONIC**
a subsidiary of FORD MOTOR COMPANY

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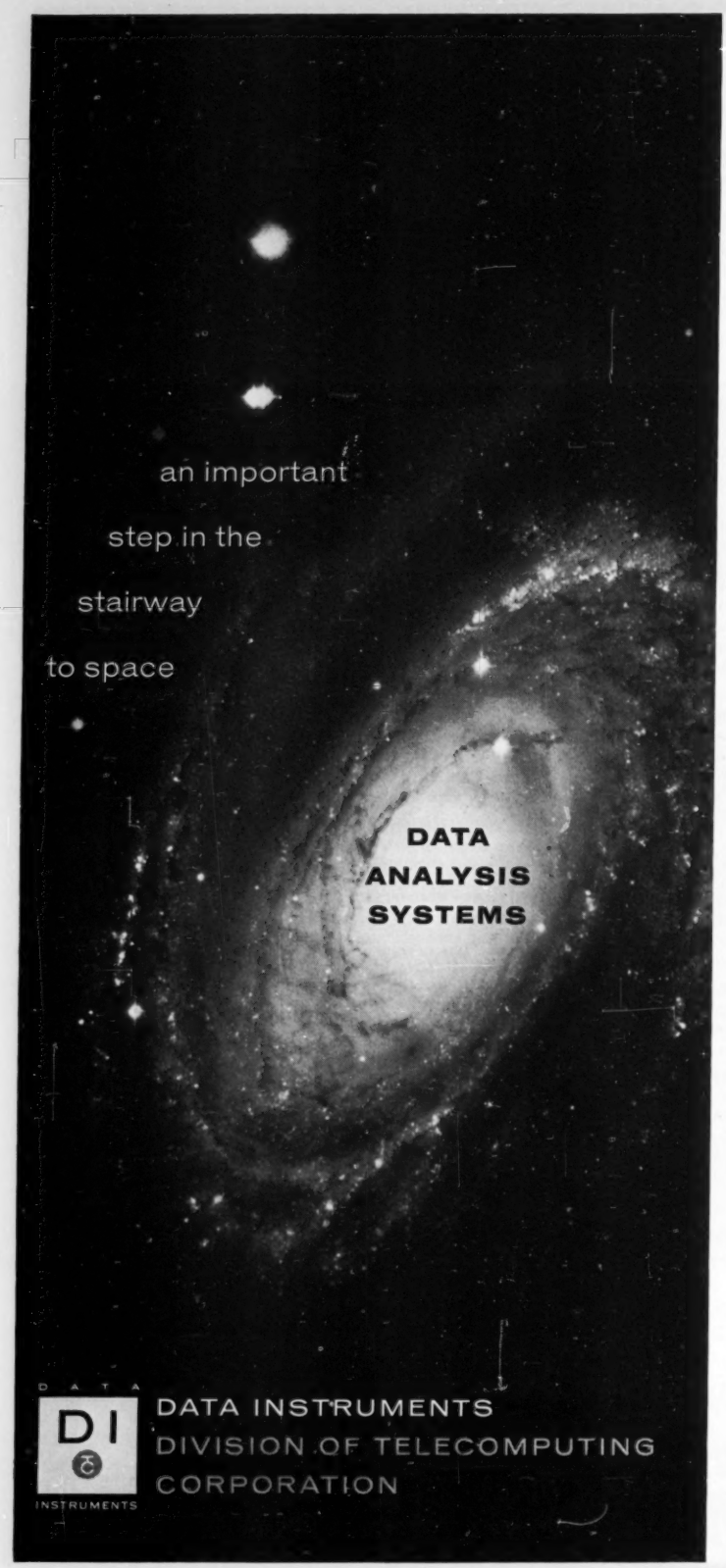

NEW LITERATURE

NEW LITERATURE: Several items of new literature are available from this company: Bulletin 3020, a four-page leaflet, details and illustrates the high-speed commutator, type 33-514. which provides a means of systematically programming a multiplicity of voltages into a data processing system; Bulletin 1599A, an eight-page, two-color brochure, describes the 40-101 series Plexicoder – low-level signal commutator. Bulletin 3014 contains details on this company's telemetry ground station systems. For copies write CONSOLIDATED ELECTRODYNAMICS, Systems Division, 300 North Sierra Madre Villa, Pasadena, Calif.

Circle 207 on Reader Service Card.

TRANSLATOR-CONVERTER: The DTC-1 DIGIDAC digital translator-converter is described and illustrated in a two-page leaflet. Model DTC-1 provides compatibility of certain analog-digital converters with read-out type digital units – shaft position encoder output, coupled with the DTC-1, can be fed directly to tape readers, tape punches, printers and computers, say the manufacturers. For copy write AERONCA, Baltimore Division, Hilltop and Frederick Roads, Baltimore 28, Maryland, or use reader card.

Circle 208 on Reader Service Card.

ANALOG-TO-DIGITAL CONVERTER: Four-page, illustrated brochure provides design information on this company's new device for shaft analog-to-digital conversion . . . a shaft rotation digitizer. Typical pulse output waveforms are shown together with applications of the device consisting of passive rotary magnetic reading head, a demodulator and a pulse multiplier. For copy write DATA INSTRUMENTS DIVISION of Telecomputing Corporation, 12838 Saticoy St., North Hollywood, Calif., or use reader card.

Circle 209 on Reader Service Card.

DIGITAL MODULES: Descriptive information and technical specifications on the new transistorized T-Pac one megacycle digital modules, are in-

cluded in this fourteen-page, fully illustrated catalog. Containing a supplement announcing recent additions to the line, Catalog T includes diagrams and photographs, along with a price list on the last page. For copy write COMPUTER CONTROL CO., INC., 92 Broad Street, Wellesley 57, Mass.
Circle 210 on Reader Service Card.

ANALOG COMPUTER: An eight-page brochure describes the MC-400 desk side analog computer. Incorporating 12 operational amplifier channels and various important components the MC-400 is compact, portable and represents a complete analog computation center, according to the manufacturer. This brochure provides schematic drawings, description of components, optional auxiliary equipment, typical applications. For copy write MID-CENTURY INSTRUMATIC CORP., 611 Broadway, New York 12, N. Y.
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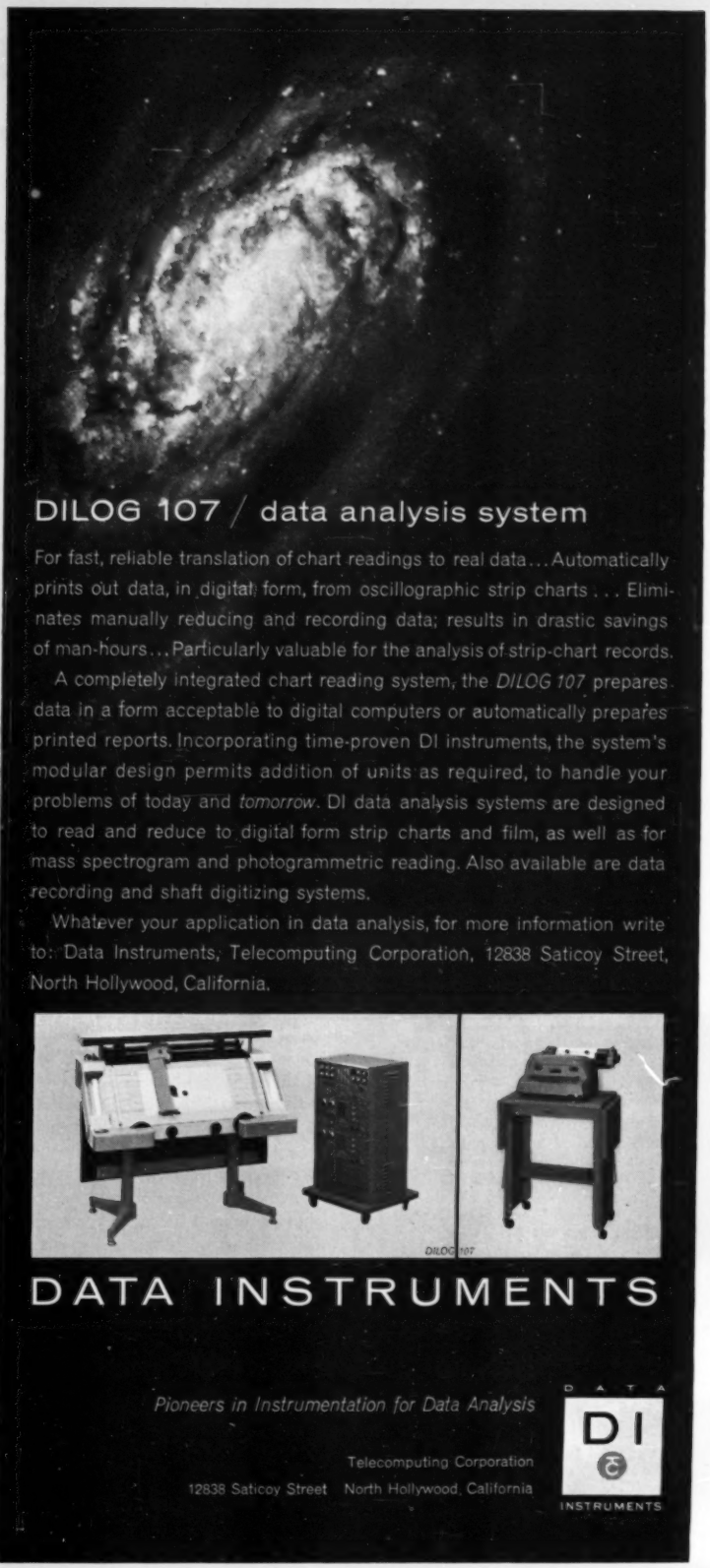
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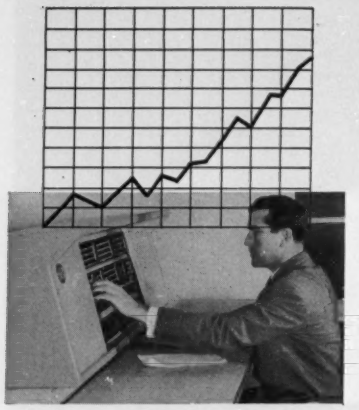

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Further reports concerning the forthcoming First International Conference on Information Processing, to be held in Paris June 13-23, indicate that the United States holds a dominant position among the fourteen nations competing for a place on the global conference program. Reporting to the recent Eastern Joint Computer Conference, Isaac L. Auerbach, Chairman of the United States Committee for the International Conference on Information Processing (USICIP), told American sponsors (IRE, ACM, AIEE) that of the 74 global abstracts presently accepted in Paris, (see November/December issue DATAMATION) one third are from this country.

However, Auerbach warned that approximately 25% of the total papers listed in the provisional advance program, will be eliminated from the final plenary session program to meet the tight schedule of the five-day technical conference. Final selection of papers will be made in Paris early February by national consultants to UNESCO (organizers of the conference). Ninety abstracts were received from this country and for the preliminary selection, Auerbach was joined in Paris by Dr. Alston Householder, Chairman of the U.S. Program Committee of USICIP, who had worked with a group of computer experts from all over the U.S. to evaluate the abstracts.

plenary sessions

The formal technical program will be held in eleven three-hour plenary sessions at the new UNESCO House, June 15-20. Formal technical papers will number about 60 and cover six major areas, (see November/December issue). There will be simultaneous oral translation of the technical papers into English, French, Russian, Spanish and German. Comments from the floor will be invited and the published Conference Proceedings will contain the entire text of the papers and the discussion from the floor, provided the latter is also submitted in writing. All abstracts and reprints will be mailed to officially registered conference participants.

This first global exhibition of information processing equipment – AUTOMATH 1959 (Automatic Mathematics 1959) – will be on display from June 13-22 in the Grand Palais in Paris, which is a few minutes from Unesco House, site of the conference. This exhibit opens before and closes after the technical program, allowing conference participants time to attend. Formal technical papers on data processing equipment in the exhibit, or announcing new equipment developments will be heard on June 22 and 23. Abstracts of these papers must be received by USICIP by January 14. Dr. Eugene Grabbe is Chairman of the U.S. Exhibits Committee. The Grand Palais will be accepted as a bonded warehouse, thus enabling exhibits to be shipped free of customs duty in care of UNESCO.

participation

American representation at the conference will be on an individual basis. However, registration will be coordinated by the United States Committee so that an official list of delegates may be submitted to the UNESCO Secretariat for mailing purposes. Symposia will be held during the conference at which interested groups will have an opportunity to discuss special subjects, such as, the relationship between digital and analog computing, the use of computers, etc. Suggestions for symposia topics are invited and may be submitted to UNESCO via the USICIP. The oral survey papers by representatives of each participating country will be presented in evening sessions.

Official registration forms, information on exhibit arrangements, transportation information and general conference releases may be obtained by writing to the United States Committee for the International Conference on Information Processing, Box 4999, Washington 8, D.C.

The USICIP has designated an official travel agent to assist conference participants in arranging vacation trips as well as tours. The arranging of chartered flights is being considered for members of the sponsoring societies and their families, subject to sufficient interest.

COMPUTER CONFERENCES

some observations, some suggestions

by KEITH UNCAPHER and MALCOLM DAVIS, engineers
and JAMES BABCOCK and SHIRLEY MARKS, programmers
The Rand Corporation

What determines the success of a conference — and specifically a joint computer conference? Some impressions of the recent Eastern Joint Computer Conference might appropriately apply to this question.

At that conference, the addresses of J. W. Forrester, Dudley Buck, Walter Bauer, and others, while consistent with the conference theme of "Modern Computers," really defined a more specific theme, a theme that might well serve to guide the selection of papers and speakers for future conferences. These speakers recognized that professional personnel, occupied in diverse branches of the computing industry, must one day come together and work in a unified effort. The impending revolution in computer technology, it was emphasized, depends on such cooperative action.

Yet other speakers at the conference seemed oblivious of this fact. Some presented papers which were too technical or otherwise had a limited appeal to a general audience. Some papers were presented in an uninteresting manner.

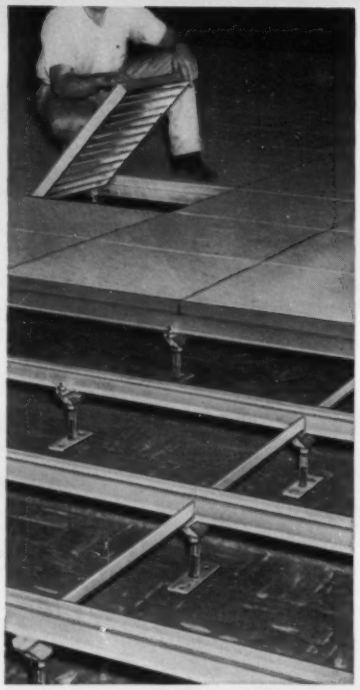
One suggestion to encourage more unity of purpose without sacrificing details of interest to specific groups is that submitted papers might be divided into two categories. More specialized papers better suited to a written presentation would be included only in the conference proceedings (and perhaps could be presented at parallel sessions). Other speakers, with papers selected for oral presentation in non-parallel sessions, might have detailed technical material appear in the proceedings. They would then be free to make a brief technical reference without detracting from the general character of their subject.

To stress the joint aspect of a joint computer conference, subjects should transcend the divisions between engineers, programmers, and users of computers, and be thought-provoking in content and presentation. As an aid to the latter aim, slides chosen to accompany oral papers should be simple, easy to read, easy to follow, and selected so as to contribute to the development of the paper.

Speakers before a general session should be chosen not only for a thorough knowledge of their subject, but for their experience in speaking informally and in a stimulating manner. For example, Dudley Buck's treatment of material that might normally have had a limited appeal, became the highlight of the December EJCC. His enthusiastic and informal delivery, with the aid of a Viewgraph, brought an obvious response from the audience.

Since a basic function of a conference is the interchange of ideas, more interplay between speakers and members of the audience must be encouraged. Fewer papers would make more time available for such spontaneous exchanges.

To return to the original question and to attempt an answer, the success of a conference can be measured by the ideas that remain after its conclusion. Papers delivered by knowledgeable speakers, eager to communicate, highlight the delegates' memories of technical sessions. Perhaps with more emphasis on this eagerness to communicate, ideas will be generated which will lead to discussion, action and further progress. And more conferences will be remembered as successes.



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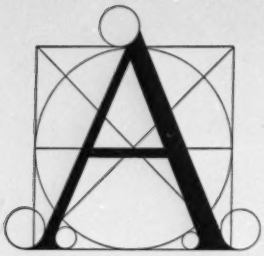

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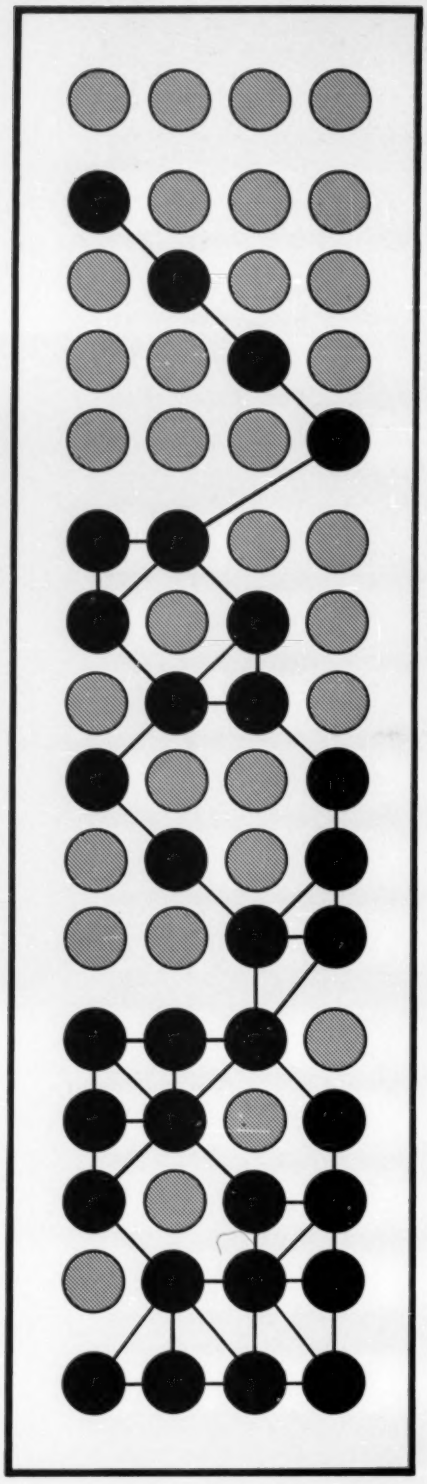

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